Telephony

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No. 105A

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The Government's Duty.

A financial writer in the Chicago Daily News says:

"The government's announcement concerning the return of the cables to private ownership at once and of the land wire system as soon as Congress can legislate to protect the owners, has larger significance than the collapse of Mr. Burleson's unlucky experiment.

Unlike the case of the railways, the temporary public operation of the wires was accompanied by an avowed declaration of purposes by the department officials in control that they meant if possible to establish government ownership. This program has gone completely to wreck in the case of the wires, and the experiment in public operation of the railways is rapidly traveling the same road.

In both cases this has occurred because an unmistakable object lesson in higher costs combined with worse service has killed the hankering after public administration of both enterprises throughout the country.

It is not yet clear exactly how far the facts bear out Mr. Burleson's assertion that new laws must be passed for supervision of private operation of the land wires because the companies are losing money and 'not making a dollar on their investments.'

The Western Union earned and paid 7 per cent dividends in both 1917 and 1918, but its net revenue in December, after four months of government operation, was $578,000 less than in July, although gross receipts were larger by $475,000. There will possibly be some effort to correct any such decrease through restraining the introduction of competitive offices by rival companies. But the people have lately learned, in the matter both of railway and wire service, that competition brings certain advantages of its own, even when rates are kept the same."

A word friendly to competition in the Daily News is surprising, for it has always been outspoken the other way.

It is certain, however, that "the facts will bear out" that some legislation must be enacted to protect the telephone companies when they are returned.

In the first place, the government stands committed to return the properties in as good condition as when they were seized August 1, 1918. This means that they are to be equally able to furnish service and continue to make both ends meet financially. Times have changed since that date.

Largely because of the administration's desire to avoid labor troubles, wages have advanced materially. Rates that were sufficient in July, 1918, are not adequate today. The government should see that the companies are assured rates that will meet existing conditions.

A recent cartoon, illustrating the government's return of the wires after nine months' use, hit it very neatly by showing the Postmaster General in the role of a man finally returning his neighbor's lawn mower with the handle broken, the wheels smashed and cogs and bolts missing.

When Uncle Sam returns the telephone plants he borrowed in time of war, he should see that they are in as good working order as they were when he reached over the fence and took them.

Administrative Salaries.

Many small telephone companies are owned by individuals, who, while giving a good portion, or all of their time to the business, look for their competency to interest derived from the capital invested in their property, feeling that their properties cannot pay both salaries and dividends. In other words, if they drew a salary, there would be no dividends and this, they feel, would injure their standing with local bankers in obtaining loans when needed.

When the time for increased rates arrives, annual charges presented to state commissions do not always show all legitimate expenses chargeable against the property. Owners of property imagine this condition will assist them in getting rate increases.

Administrative expenses are legitimate, regardless of size of property. They are supposed to be included in annual expense statements and, very frequently, would be the controlling factor in determining as to whether or not a property is entitled to additional rates. One very prominent engineer for a state commission has so expressed himself.

The average small telephone company should have administrative salaries charged on its books and they should be shown to the commissions. Then in many instances, increased rates would be secured.

Wilson Advocates Return of Wires

In Message to New Congress President Wilson Declares for Return of Wires as Soon as Transfer Can Be Effected Without Administrative Confusion—Advocates Legislative Action to Unify and Co-ordinate Systems

On Monday, May 19, the 66th Congress held its opening session which was devoted principally to the work of organization.

Republican senators at a conference agreed upon a bill for repeal of the wire control act and for immediate return of the wire systems to their owners.

In the House a joint resolution to return telegraph and telephone systems to private management was introduced by Representative Steenerson of Minnesota, Republican. It calls on the President for itemized report of all expenditures and receipts since the properties were taken over and a report showing financial results of government operation. Relinquishment of government control would depend on the time of passage of the resolution.

On Tuesday, the President's message which had been cabled from France was read. In it he announced definitely that the railroad systems and the wire lines would be returned to private control.

Opposed to U. S. Operation.

The President's recommendation regarding return of the railways and wire lines was the first authoritative declaration by the administration of its future policy. It greatly surprised many who had interpreted the developments of the last few months to mean that Mr. Wilson eventually would propose some form of permanent government operation. On the contrary the directness of the President's declaration on that point left no doubt that he was through with any possible scheme of permanent retention.

"The telegraph and telephone lines," said the message, "will, of course, be returned to their owners as soon as the transfer can be effected without administrative confusion. The railroads will be handed over to their owners at the end of the calendar year."

In the case of each, the President asked for legislation to make easier the readjustments necessitated by the change.

President Wilson suggests that legislation should be considered with the purpose in view of bringing about "a uniform and co-ordinated system which will afford those who use them as complete and certain means of communication with all parts of the country as has so long been afforded by the postal system of the government and at rates as uniform and intelligible."

He points out that "there are many confusions and inconsistencies of rates." He declares that an exhaustive study of the whole question of electrical communication and of the means by which the central authority of the nation can be used to unify and improve, would certainly result in a great public benefit.

The section of the message relating to the wires is as follows:

Wires to Be Returned to Owners.

"The telegraph and telephone lines will, of course, be returned to their owners ass ,oon as the re-transfer can be effected without administrative confusion; so soon, that is, as the change can be made with least possible inconvenience to the public and to the owners themselves.

"The railroads will be handed over to their owners at the end of the calendar year; if I were in immediate contact with the administrative questions which must govern the re-transfer of the telegraph and telephone lines I could name the exact date for their return also.

"Until I am in direct contact with the practical questions involved I can only suggest that in the case of the telegraphs and telephones, as in the case of the railways, it is clearly desirable in the public interest that some legislation should be considered which may tend to make of these indispensable instrumentalities of our modern life a uniform and co-ordinated system which will afford those who use them as complete and certain means of communication with all parts of the country as has so long been afforded by the postal system of the government and at rates as uniform and intelligible.

"Expert advice is, of course, available in this very practical matter and the public interest is manifest.

"Neither the telegraph nor the telephone service of the country can be said to be in any sense a national system. There are many confusions and inconsistencies of rates. The scientific means by which communication by such instrumentalities can be rendered more thorough and satisfactory has not been made full use of.

"An exhaustive study of the whole question of electrical communication and of the means by which the central authority of the nation can be used to unify and improve it, if undertaken by the appropriate committees of the Congress, would certainly result, indirectly even if not directly, in a great public benefit."

U. S. Association Active.

The executive committee of the United States Independent Telephone Association has held several meetings to consider the problems now confronting the Independent telephone industry and consulting as to the steps to be taken that will best protect the Independent properties.

It was thought advisable in order to properly inform the public and members of Congress, that President G. W. Robinson should join with Theodore N. Vail, president of the American Telephone & Telegraph Co. in the issuance of a statement setting forth in brief, concise form the situation of the companies, the desire of the companies that they have their properties returned to them immediately, and that while doing so Congress have in mind the necessity of properly compensating the companies, as provided by the act of Congress under which the telephone properties were taken possession of by the government.

As no award of compensation has been made to practically all of the B and C class companies and many of the A class companies, it seems essential that while legislating relative to the return of the properties, Congress should provide for just compensation to the companies.

The board of directors of the association held a meeting in Washington on Wednesday of this week, May 21, to further discuss the general situation and formulate plans.

It is generally agreed that the telephone properties when returned to their owners should be returned at midnight on the last day of a month so that all accounts can be closed at the end of the month and financial adjustments between the companies and the government facilitated.

Joint Letter to Congress Members.

Copies of the following letter, sent May 19, to the members of the Senate and House of Representatives, prepared by Mr. Vail and Mr. Robinson, have been sent to members of The United States association from the Washington office by Vice-President F. B. MacKinnon, with the suggestion that as much publicity as possible be given it:

"On midnight July 31, 1918, under the authority of Congress for war purposes, the President took supervision, possession, control, and operation of the telephone systems of the country and has since operated them. The war has practically ceased. The public press is strongly demanding, the general public and the owners of the telephone properties are urging, that they be returned as speedily as possible, that former conditions may be restored and more satisfac-

tory service be afforded. The President and the Postmaster-General have announced that this will be done as soon as adequate arrangements be provided for receiving and advantageously operating them. It remains only for Congress to enact such legislation as speedily as possible.

The expenses of these systems have largely increased during the past year, for wages alone at the rate of more than $20,000,000 per annum. This was inevitable and necessary by reason of larger proportional increases by the railroads and industries of the country. The revenues are inadequate to care for such increases, and the deficit of the government on that account to date is large and steadily increasing. The Postmaster-General ordered that steps be taken to secure adequate revenues, but contentions with the regulatory authorities of the states, not yet settled, have prevented such adjustments.

If such conditions continue, necessarily the credit of the operating companies will be impaired, proper expenses cannot be met, the best operating forces cannot be retained, needed extensions and satisfactory service cannot be provided. A deterioration will ensue which in some localities may threaten a recurrence to public ownership or operation in order to care, even inadequately, for public needs. By prompt action Congress can prevent this contingency.

Just and speedy settlement should be made for all properties taken under the existing law, that such balances now in the possession of the government may be restored to assist in the upbuilding and extension of the various systems for better public use. The conditions and regulation of operation should be clearly defined so as to permit the companies to reestablish and maintain a satisfactory service with reasonable rates without discrimination and procure the benefits of legitimate competition.

The principal operating telephone companies of the United States are vitally interested in co-operating with Congress and the officials of the government to accomplish these results."

California Commission Denies Burleson's Authority.

In a letter to the various telephone companies operating in the state, the California Railroad Commission denies the authority of Postmaster General Burleson to increase toll and exchange rates in violation of the state public utilities act. The letter, which is signed by Secretary W. R. Williams, follows:

"Under the public utilities act of California no telephone company can, without the consent of the railroad commission, put into effect an increased toll or exchange rate for telephone service between points within the state of California.

Postmaster General Burleson is assuming to put into effect in California increased toll and exchange telephone rates in violation of the public utilities act and without the authority of the railroad commission.

We desire to state that the railroad commission denies the authority of the Postmaster General to do this, and each of the said increased toll or exchange telephone rates put into effect in this state is unauthorized and illegal.

In view of the fact that Postmaster General Burleson, through the telephone companies, is actually putting into effect and charging the patrons of the telephone companies in California unauthorized and illegal increased telephone rates, you are hereby directed by the railroad commission of the state of California to keep an account of the amount of each such increased toll or exchange telephone rate charged and collected by you and the name of the patron from whom the same is collected, so that at any time it may be ascertained with reference to each patron the amount of such increased and illegal charge."

Denies Injunction Against Rates Fixed by Burleson.

On the ground that the state and city authorities have no recourse when the federal government by a war measure took over the telephone systems and while in control, raised the local rates, Judge Samuel B. Kirby of the Jefferson circuit court denied an injunction sought by the city of Louisville, Ky., to prevent the Home and Cumberland telephone companies from putting into effect increased rate schedules.

The court held that as long as the government should control the local properties under a war measure, contracts between the companies and the city are void.

Idaho Protests Against Rates Increased by Burleson.

The Idaho Public Utilities Commission, on May 3, filed application, supported by a complaint in the Third judicial district court, for a writ of injunction to be directed against the Mountain States Telephone & Telegraph Co. and Albert S. Burleson, as Postmaster General of the United States, to restrain them from putting into force and effect an increase in telephone rates over the southern Idaho territory of the company of approximately 50 cents per month per telephone.

The rates went into effect, under Burleson's order, May 1. Judges Charles F. Reddock and Charles P. McCarthy authorized a temporary injunction order prohibiting the rates to go into effect. It was returnable May 22, when arguments were to have been heard on the merits of the application.

It is charged by the public utilities commission that the defendants "illegally and unlawfully and without authority of law, contrary to the act of Congress and the proclamation of President Wilson, and contrary to the constitution of the United States, announced the increase in rates."

Minnesota Supreme Court to Hear Telephone Case in June.

The appeal of the Northwestern Telephone Exchange Co., of Minneapolis, Minn., from an order of the Ramsey county district court, granting a temporary injunction restraining telephone rate increases approved by Postmaster General Burleson, has been set for hearing by the Minnesota Supreme Court on June 17.

Telephone and Telegraph Systems in Belgium Being Rebuilt.

When the Germans destroyed the telephone system of Belgium, they calculated that it would take two years to restore it. The two chief central exchanges at Brussels were entirely removed, and the third was destroyed. The heads were cut off 50 underground cables, each made up of from 200 to 400 wires, while separate wires were cut in several places in such a way as to make them especially difficult to repair. Equipment was torn down and removed; one of the big "multiples" was entirely destroyed. The whole telephone installation will have to be rebuilt and the work is now going on.

Exchanges in other towns suffered the same fate. The wires in private houses were cut, and in many cases the instruments were removed.

The same conditions prevail at the Central Telegraph Office. The great switchboard serving as an exchange for the whole of the country was stripped. The main instrument room was left simply empty. At the end of March there was no cable communication with England, except by way of Holland and France. There was only one wire working between the French frontier and Paris. It was 4½ months before the Germans succeeded in discovering, although it had been laid by Siemens, how the Belgians had managed to keep the underground telephone line from Antwerp working surreptitiously for days after the occupation.

Suit to Enjoin Increased Rates.

The Kansas Public Utilities Commission, on May 3, filed in the Shawnee county district court suit to enjoin the Southwestern Bell Telephone Co. from putting into effect in Kansas the increase of rates announced as operative May 1.

Athens Home Takes Over Bell Plant

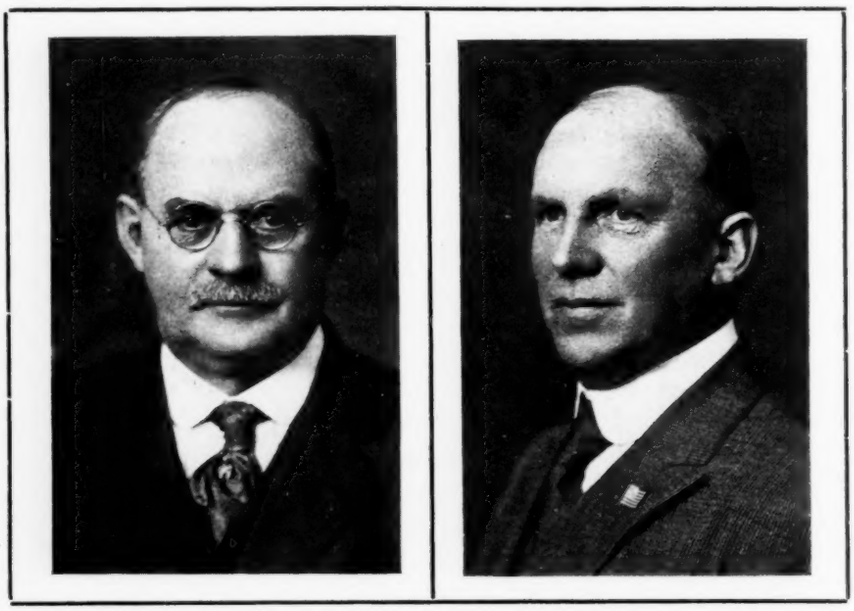
After Long and Bitter Competitive Struggle Athens County Home Company Controls Local Field at Athens, Ohio—History of Organization and Growth of Home Company Which Now Operates 1,800 Telephones in a City of 6,000

By L. M. Peterson

The Athens County Home Telephone Co. is now in sole possession of the field at Athens, Ohio, and the immediate vicinity, the Central Union Telephone Co. having sold its local properties to the Home company for a consideration of $34,400, $15,000 to be paid in common stock and $19,400 in preferred.

The telephone history of Athens county is very much similar to that of other competitive communities. An unsatisfied demand for better service and facilities for communication between the business centers of the county and the county seat was the natural cause for the organization of a Home company in Athens and the establishment of a competitive system.

It was in the dental office of Dr. C. L. Jones, the present general manager of the Athens County Home company, that the first Independent toll station was installed in Athens in the summer of 1899. For two years this toll station, operated by Dr. Jones, furnished the only communication by telephone with the rural district and towns in the south and west parts of the county.



Dr. A. F. Holmes, President, and Dr. C. L. Jones, General Manager, of the Athens County Home Telephone Co., Have Been Associated With the Company Since Its Inception and No Little Credit Is Due Them for Its Success.

In the meantime Independent exchanges were established at McArthur and Albany, followed by the installation of a 20-line magneto switchboard a half a square away from Dr. Jones' office. This board was installed in a room 10 by 20 ft., which later housed 770 lines of magneto equipment and had the distinction of doing more business to the square inch than any other exchange in the state.

At the time the 20-line switchboard was installed (in 1901) the Bell company's exchange in Athens had but 110 telephones, after having had a monopoly of the field for seven years. It had no telephones in the rural districts, rates were high and the service reached but a few of the better class.

The idea of a new telephone system which promised to give adequate service became so popular that the solicitor for the Home company secured as subscribers in a single day practically all of the business people in Athens. The residences also followed in rapid succession, so that the success of the Home company seemed assured. Companies were organized at Glouster, Nelsonville, Amesville, Jerseyville and Coolville almost simultaneously and within a year the work of developing a county system, with the Athens plant as a center, was well under way.

The Bell company rebuilt its exchange and secured 200 subscribers at 50 cents per month, as against a rate of $1.50 prior to the advent of the Independent company in the field. Against all these odds, the Home exchange grew by leaps and bounds, as did the other 12 Independent exchanges in the county. An efficient toll system was built, connecting them up as a unit.

In a few years the Athens exchange was taxed to its capacity. The exchange was moved to its present location in 1909 and new common battery equipment of a capacity to meet the demands of the community for 10 years was installed. The growth of the Home company has been steady, though gradual, from year to year, while the Bell competition, even with its ruthlessness, had grown less menacing to the Athens County Home Telephone Co.

For some time past negotiations have been under way between the Home and Bell companies for the sale of the Bell plant to the Home company. In July, 1918, a joint petition was filed with the Ohio Public Utilities Commission for the approval of the sale and unification of the properties.

Following the filing of the petition the commission made an appraisal and established a valuation upon the physical property which would be affected by the merger. The valuation placed upon the combined properties of the Home and Bell companies amounted to $200,382, reproduction value, and $162,556, present value. A reproduction value of $49,931 and a present value of $37,024 were placed upon the Bell properties involved in the transaction.

Finding that the interests of the telephone-using public would be more adequately served by one system, the commission handed down its ruling late in April, approving the sale and merger of the properties. The Athens County Home company was authorized by the commission to issue and deliver to the Bell company, in compensation for its Athens property, $15,000 par value of common stock and $19,400 par value of preferred stock.

The company was also authorized by the commission to put into effect the following schedule of net monthly rates upon the consolidation of the two exchanges on May 1, on which date the Postmaster General also approved the schedule:

Individual business	$3.25
Two-party business	2.50
Extension business with bell	1.00
Extension business without bell	.75
Private branch exchange service:	
Trunks	3.25
Stations	1.00
Rural business	2.00
Individual residence	2.00

Home of the Athens County Home Telephone Co.

Two-party residence	1.75
Four-party residence (desk)	1.50
Four-party residence (wall)	1.25
Extension residence with bell	.75
Extension residence without bell	.50
Eight-party suburban residence	1.25
Rural residence (metallic)	1.50
Rural residence (grounded)	1.25
Extension bells	.25
Rural switching service	.50

The company is permitted to quote rates 25 cents per month in excess of the rates quoted for exchange and rural service, that amount to be allowed as a discount for payment by the 15th of the current month.

The Home company operates about 1,800 telephones in the city of Athens, with a population of some 6,000—one telephone for every three inhabitants. Of the 668 telephones taken over from the Bell company 321 were duplicates, so in round numbers the company increased its subscribers' list by 300. In addition it furnishes service to some 500 rural subscribers in that vicinity from its Athens exchange and operates 600 telephones at Albany, Chauncey and The Plains.

The company's exchange equipment consists of a 12-position Dean common battery multiple switchboard with full harmonic equipment, including eight-party selective common battery and magneto service which is used very extensively by its rural patrons with a great deal of satisfaction.

In the past few months General Manager Jones has installed the Addressograph's card system of billing and also the National Cash Register Co.'s system of receipting and clipping off the coupon stub from the card. In the accompanying illustration is shown a card after it has been run through the cash register. The dotted line shows where the receipt is clipped off by the cash register.

With 98 stockholders, including the bankers and substantial business men of Athens, the Athens County Home Telephone Co. is truly a "home" company.

The officers of the company are as follows: President, Dr. A. F. Holmes; vice-president, S. M. Goodrich; treasurer, W. E. Moler; secretary, A. L. Moler; general manager, Dr. C. L. Jones.

Dr. Holmes has been associated with the company since its inception in 1899. He was treasurer until 1910, since which time he has been president of the organization. He is also interested in the Home Telephone Co., of Parkersburg, W. Va., of which he is a director.

Dr. Holmes is conservative, broad-minded and has good business ability, but believes in playing safe. He has a good mind for facts and quickly picks out the flaws in a proposition, as he is of an analytical and methodical nature.

With an excellent understanding of people, Dr. Holmes knows how to get along with them without friction. He is sympathetic and makes many lasting friendships.

After practicing medicine at Albany, Ohio, from 1883 to 1918, Dr. Holmes accepted a position on the medical staff of the Athens State Hospital, at Athens, Ohio.

General Manager Jones graduated in dentistry at the University of Maryland in 1895, after having spent five years in collegiate work at the Ohio University and one year in mechanical engineering at the Rose Polytechnic Institute, Terre Haute, Ind. Dr. Jones was one of the organizers of the Home company and has been associated with it since its inception.

In addition to managing the Athens County properties, he is manager of the Marshfield Telephone Co., operating at New Marshfield and Carbondale, Ohio, the Ohio State Telephone Co.'s exchanges at Nelsonville, Murray City and Carbon Hill, and the Home Telephone Co., at Coolville and Belpre, Ohio. He has been a director of the Ohio Independent Telephone Association for a number of years and is a staunch booster of Independent telephony in that state.

Dr. Jones is a man of foresight and is quick to grasp details. He has lots of force and energy and is a hard worker. He is a "go-getter" and producer. With the combination of Dr. Holmes' executive ability and Dr. Jones' administrative ability, it is little wonder that the Athens County Home Telephone Co. has won out in the face of most adverse circumstances.

Kansas Convention in June.

The Kansas Independent Telephone Association will hold its next annual convention June 4, 5 and 6 at the National Hotel, Topeka, Kans. A strong program and splendid entertainment is being arranged and every effort will be made that this may be the largest and best convention ever held in Kansas.

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Card System of Billing and Receipting Used by the Athens County Home Company.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

1191. Why is the character of the traffic load in the 100-line automatic system apt to be erratic as to character? How many trunks may be allotted as a maximum to the outgoing traffic from any given group of 100-lines in the three-digit system? What is true of the outgoing traffic in any given group of 100-line circuits? When is the first selector trunk seized that is to be used in completing the *next* outgoing call from its own group of line circuits?

1192. Why must all the outgoing calls from any given group of 100 lines pass through a group containing not more than ten trunks at most? What fact makes it possible to utilize less than the full number of trunks in the circuit groups assigned to certain line groups? What determines the number of connector switches required for serving any given group of lines? What is the basic circuit group, for the consideration of traffic conditions, in the three-digit automatic system? Are all the connectors in the three-digit exchange in one traffic group? If not, why not? What connector trunks are in the same traffic group? What makes them parts of the same group? Will there be a greater number of first selectors required, in any given set of conditions, than of connectors? Why is this so?

1193. Why is the application of the average number of calls per line during the busy hour an unsafe basis for estimating the number of trunk circuits required in the automatic exchange? What motion of the first selector switch is controlled from the calling station? What selection is made by the vertical motion of the first selector switch of the three-digit exchange?

1194. What is one formula for calculating the number of trunk circuits required to meet any given set of traffic conditions? What is the group factor for a busy-hour calling rate of 1.4 calls per line with circuits in groups of 50 lines per group? For a busy-hour calling rate of 0.8 call per line with groups of 100 lines each? Explain how you obtained these results.

CHAPTER XXXII. Mechanical Switching (Continued).

1195. *Function of first digit.*—It has been stated that the vertical motion of the first selector is the only motion of this switch in building the completed connection that is under the control of the calling subscriber. In a three-digit system it is used to select a trunk leading to the group of 100 lines containing the called line.

In *any* automatic system the first selector is controlled by the impulses sent out from the calling station as the sending device is released after it has been pulled to the first position. It may be said, therefore, that the first digit of any automatic exchange, containing more than 100 lines, determines the number of vertical steps to be taken by the first selector.

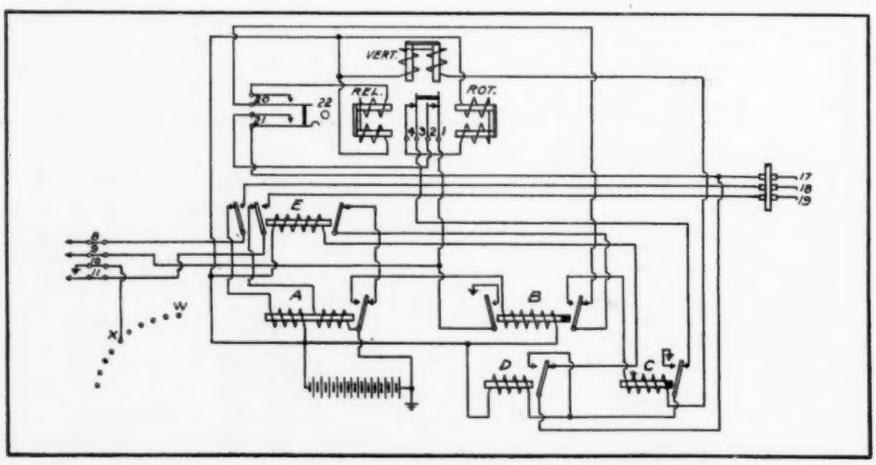

Fig. 296. Two-Wire First Selector Circuit.

The number of rotary steps to be taken by the first selector, after reaching the destined bank level, is determined by the number of *busy trunks intervening* between the beginning of the level and the available bank contact.

1196. *Operation of first selector.*—The wiring of one standard type of first selector, the two-wire common battery so-called, is shown in Fig. 296. The mechanical construction of the switch itself is similar to that of the connector, having a vertical, rotary and release magnet but lacking the side switch and its mechanism.

As shown, the line switch banks form one terminal of the first selector trunk while the switch itself forms the other. The master switch banks are shown in the drawing as the row of contacts arranged in the sector of a circle at *X* and *W*.

When the incoming call causes the plunger of the line switch to be operated, the line-switch bank contacts, 8, 9, 10 and 11, are closed as shown, completing a circuit from the calling telephone to the first selector in just the same way as the calling circuit is completed in the 100-line system to the connector terminals.

When slow-acting relay *B*, Fig. 296, is operated, the grounded terminal of the common battery is connected to the winding of the line bridge cut-off relay through the normally-open line-switch bank contact 9 (now closed) and the normally-open contact of relay *B*.

This assures the operation of the calling line bridge cut-off relay and protects the calling line against an intruding call. The protection is effected by the connection of the grounded terminal of the common battery to the private bank contact of the calling line by the operation of slow-acting relay *B*.

1197. *Circuit of the first selector.*—When the sending device at the calling station is released, in order to send current impulses corresponding to the first digit, an intermittently opened and closed circuit is created which is traceable as follows:

Starting at the positive or grounded terminal of the common battery, the current passes through one winding of the double-wound relay *A*, the normally-

closed make-and-break contact of relay *E*, the line-switch bank contact 11 (now closed), the calling line, through the line equipment, the calling telephone sending device, the line-switch bank contact 8 (now closed), after passing through the line equipment again, the normally-closed make-and-break contact of relay *E*, the other winding of double-wound relay *A*, and the common battery.

Each time that this circuit is closed by the calling sending device, double-wound relay *A* is operated, and each time that it is opened double-wound relay *A* is released. When relay *A* is operated, it closes an obvious circuit through its normally-open make-and-break contact, the common battery, and the winding of slow-acting relay *B*.

As a result of current flow in its winding, relay *B* is energized and, since it is a slow-acting relay, it will remain energized as long as the stream of impulses causes relay *A* to be intermittently energized. Slow-acting relay *B*, therefore, remains continuously energized and operated as long as the stream of impulses from the sending device of the calling telephone continues to flow.

With relay *B* in the operated position, each release of the armature of double-wound relay *A* causes an impulse of current to flow over a circuit traceable as follows:

Starting at the positive or grounded terminal of the common battery, the current passes through the normally-closed make-and-break contact of double-wound relay *A*, the normally-closed contact of relay *E*, the normally-open make-and-break contact of slow-acting relay *B* (now held closed), the winding of slow-acting relay *C*, the vertical magnet and the common battery.

As a result of intermittent current flow over the circuit traced, slow-acting relay *C* is held continuously energized and operated and the switch wiper shaft is raised to the level corresponding to the number of interruptions in the circuit through the sending device of the called telephone. In other words, the wipers of the first selector switch are raised until they are poised at the entrance of the bank level containing trunk terminals leading to connectors serving the line group in which the *called* line is found.

1198. *The rotary steps.*—When the sending device at the telephone reaches its normal position, the circuit through it is continuously closed and double-wound relay *A* is continuously energized and held in the operated position. This interrupts the intermittent flow of current through the winding of slow-acting relay *C*, causing it to release its armature.

The initial operation of slow-acting relay *C*, however, has completed an obvious path through the winding of relay *D* and the common battery. Relay *D*, once operated in this way, completes a locking circuit through its own normally-open make-and-break contact (now closed) which is traceable as follows:

Starting at the positive or grounded terminal of the common battery, this current flows through the normally-open contact of slow-acting relay *B* (now closed), one of the normally-closed contacts of the rotary magnet, off-normal switch contact 21 (now closed but normally open), the normally-open make-and-break contact of relay *D* (now closed), the winding of relay *D*, and the common battery.

Owing to the flow of current in the circuit traced, relay *D* will remain continuously energized and operated as long as slow-acting relay *B* remains operated; the rotary magnet is not operated and the switch shaft is not returned to normal.

As will be shortly explained, the ground connection originally obtained through the contact of slow-acting relay *B* is preserved through private wiper 17 when the bank contacts reached and tested are busy.

At this stage of the first selector switch operation, the termination of the stream of first digit impulses, double-wound relay *A*, slow-acting relay *B*, and relay *D* are energized and in the operated position, and the switch wipers are about to enter the bank level to which they have been raised. The calling subscriber is presumably preparing to pull the sending device to its place preparatory to releasing it for the series of switch-driving impulses for the second digit.

1199. *Energization of the rotary magnet.*—When this stage has been reached, the rotary magnet is intermittently energized by a flow of current over a path traceable as follows:

Starting at the positive or grounded terminal of the common battery, the current passes through the normally-open contact of slow-acting relay *B* (now closed), the normally-closed first contact of the rotary magnet, the normally-open off-normal contact 21 (now closed), the normally-open make-and-break contact of relay *D* (now closed), the normally-closed make-and-break contact of slow-acting relay *C*, the second normally-closed contact of the rotary magnet, the winding of the rotary magnet, and the common battery.

As a result of the flow of current through the circuit traced, the rotary magnet is operated and energized and both its normally-closed contacts are opened. At the same time, the switch wipers are advanced by the operation of its armature, one step into the selected bank level.

It will be remembered that the locking circuit for relay *D* passed through one of the normally-closed contacts of the rotary magnet to reach the positive terminal of the common battery. When the operation of the rotary magnet armature breaks this circuit, relay *D* will be at once released unless the first set of bank contacts in the selected level is *busy*.

In case the first set of bank contacts in the selected level does not belong to a busy trunk, it is proper that relay *D* should be released in order to break the energizing circuit of the rotary magnet and prevent further advance into the selected level. Should the first set of bank contacts be connected to an engaged trunk, the energizing circuit of relay *D* will be preserved by the connection with the positive or grounded terminal of the common battery obtained through the private wiper 17.

As will be shown later, the private wiper of the switch places the contact upon which it is resting, in contact with the positive or grounded terminal of the common battery, just as the connector switch private wiper does, in order to prevent the intrusion of another first selector switch working on another call at another bank of the same group. When the first selector switch rests upon a set of engaged contacts, therefore, the energizing and locking circuit for *its* relay, *D*, is preserved through the private wiper, the private bank contact, the bank wiring, and the bank contact and private wiper of the other switch resting on the similarly placed set of bank contacts elsewhere.

This provision by retaining relay *D* in the operated condition, assures another rotary step of the switch wipers and will assure the continuance of the rotary steps until a non-busy set of bank contacts is reached in the level selected. When this occurs, relay *D* will be released, the energizing circuit of the rotary magnet will be broken, and the switch wipers will come to rest on the bank contacts of an available trunk leading to a connector switch.

(*To be continued.*)

Order Restraining Rate Increase in Utah Dissolved.

Dissolution of an order granted by the third district court restraining the Mountain States Telephone & Telegraph Co. from collecting increased rates ordered by the Postmaster General was made May 10 by Judge Tillman D. Johnson in the United States district court at Salt Lake City, Utah.

The restraining order was granted May 1 by Judge W. H. Bramel in the third district court of Utah, and later the case was moved to the federal court.

Telephone Rate Increase in Florida Enjoined by Court.

United States Judge W. B. Sheppard, at Pensacola, Fla., issued an order May 5 restraining the Southern Bell Telephone Co. from putting into effect the new rates made effective May 1, under the order of Postmaster General Burleson.

Operation of Thermionic Amplifier

Theory of Operation of Three-Electrode Thermionic Vacuum Tube Based on Fundamental Equation of Family of Characteristic Curves for Various Plate and Grid Voltages—Reprinted by Permission of Institute of Radio Engineers

By H. J. van der Bijl, M. A., Ph. D.

V. Experimental Determination of the Constants of the Tube and Verification of the Characteristic Equation.

In order experimentally to verify equation (6) it is necessary to know the value of the constants γ and ϵ. Both these constants can be determined by methods which do not depend on the exponent of the equation. The linear stray field relation

$$E_s = \gamma E_B + \epsilon, \qquad (3)$$

which is involved in equation (6) is also independent of the exponent. The constants γ and ϵ can be determined and the relation (3) tested as follows:

Let us assume an arbitrary exponent β for equation (6):

$$I = \alpha (\gamma E_B + E_c + \epsilon)^\beta. \qquad (16)$$

Taking the general case in which both E_B and E_c are variable, we have:

$$\frac{dI}{dE_c} = \frac{\partial I}{\partial E_B}\frac{dE_B}{dE_c} + \frac{\partial I}{\partial E_c}.$$

Now

$$\frac{\partial I}{\partial E_B} = \alpha\beta\gamma(\gamma E_B + E_c + \epsilon)^{\beta-1},$$

$$\frac{\partial I}{\partial E_c} = \alpha\beta(\gamma E_B + E_c + \epsilon)^{\beta-1}.$$

Hence

$$\frac{dI}{dE_c} = \alpha\beta(\gamma E_B + E_c + \epsilon)^{\beta-1}\left(\gamma\frac{dE_B}{dE_c} + 1\right) \qquad (17)$$

Now, let I be constant, then

$$\gamma E_B + E_c + \epsilon = 0,$$

that is,

$$-E_c = \gamma E_B + \epsilon = E_s, \qquad (18)$$

$$\frac{dE_B}{dE_c} = -\frac{1}{\gamma}.$$

Integrating and putting $\frac{1}{\gamma}$ equal to μ_0, we get

$$E_B' = E_B + \mu_0 E_c. \qquad (19)$$

Equations (18) and (19) are, therefore, independent of the exponent of (6). Equation (18) gives the case in which the current has the constant value zero. It shows that E_s in equation (3) is simply the absolute value of the grid potential E_c, which suffices to reduce the current to the anode to zero when the anode has a potential E_B. (The potentials are referred to that of the filament which is supposed to be grounded.) Referring to Fig. 5, we see that equation (18) gives the relation between the intercepts of the curves on the axis of grid potential E_c and the corresponding values of anode potentials E_B. This is the method which I used several years ago to test the linear stray field relation (3). The accuracy with which this relation is obeyed is seen from Figs. 3 and 5 of my above-mentioned publication.[9]

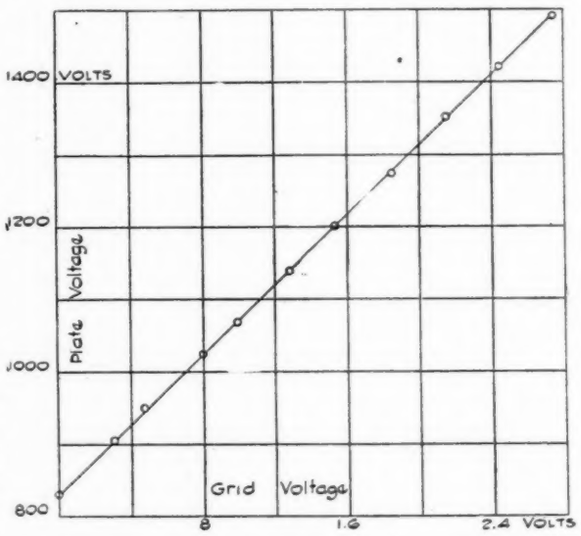

Fig. 6.

The factor μ_0, which plays a very important part in the theory of operation of the thermionic amplifier, can be obtained by taking the slope of the curve giving the relation between E_B and E_c in accordance with equation (18). It can be more easily determined with the help of equation (19), which gives the relation between the anode and grid potentials necessary to maintain the current at some convenient constant value. Fig. 6 gives results obtained in this manner. The linear relation obtained between E_B and E_c verifies equation (19).

Another method of determining μ_0 is with the help of equation (11):

$$\frac{Q}{S} = \gamma = \frac{1}{\mu_0}. \qquad (11)$$

S is the slope of the curve giving the current to the anode as a function of the grid potential, and Q the slope of the curve which gives the current as a function of the anode potential. Since both these slopes depend upon the anode and grid potentials E_B and E_c, they must be measured for the same values of E_B and E_c. This method gives quite reliable results but is not as convenient as the one explained above.

The most convenient method of measuring the amplification constant μ_0 is that recently given by Miller.[10] The principle of this method is the same as one that has been frequently used in this laboratory where it is necessary to determine μ_0 for a large number of tubes.

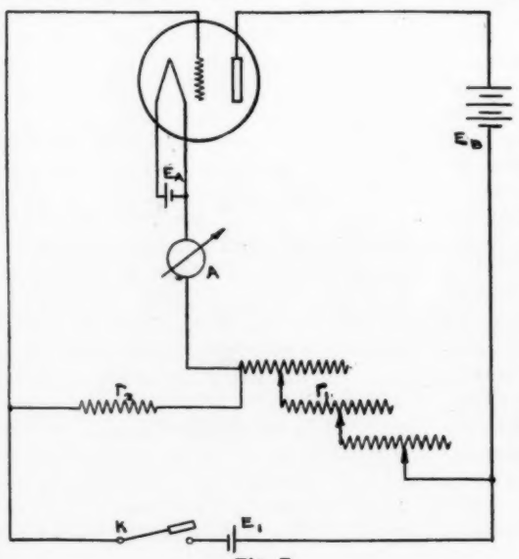

Fig. 7.

The circuit which is shown in Fig. 7 is contained in a box with terminals for the ammeter A and batteries E_B and E_A. The tube is plugged into a socket provided for it in the box. It is seen from the previous paragraph that a voltage in the grid circuit is equivalent to μ_0-times that voltage in the plate circuit. Hence, referring to Fig. 7, it is evident that no change will be

[9] "Vehr. d. D. Phys. Ges.," above. For further experimental verification of this relation when applied to the case in which the cathode consists of a hot filament, see H. J. van der Bijl, "Phys. Rev.," (2), 12, 184, 1918.

[10] J. M. Miller, Proceeding of The Institute of Radio Engineers, volume 6, page 141, 1918.

produced in the ammeter A on closing the key K, if $\frac{r_1}{r_2} = \mu_0$.

For convenience in measurement, r_2 is a fixed value of 10 ohms, and r_1 consists of three dial rheostats of 1,000, 100, and 10 ohms arranged in steps of 100, 10, and 1 ohms each. The rheostats are marked in tenths of the actual resistances, so that the setting of the dials read the μ_0 directly.

The drain of the battery E_1 is very small because the circuit is only closed momentarily by the push button K. This battery, therefore, consists of small dry cells inclosed in the box. Instead of using a direct current supplied by the battery E_1, an alternating current can be used, in which case the ammeter A must be replaced by a telephone receiver.

The use of an alternating current has the advantage that it allows a simple determination of the impedance of the tube according to the method given by Miller. Fig. 8 shows a photograph of the μ_0-meter with a tube inserted in its socket. The rheostat R enables the filament current to be adjusted to the desired value.

In order to test the characteristic equation (6) it is still necessary to know the value of ϵ. This can be obtained by applying a convenient negative potential to the grid and keeping it constant while observing the current to the anode for various values of the anode potential.

The grid being negative with respect to the filament, no current could be established in the filament-grid circuit. There should be no resistance in the circuit FPE except that of the ammeter, and this should be small compared with the internal output resistance of the amplifier itself.

Under these conditions the voltage of the battery E is always equal to E_B, the voltage between filament and anode, so that the observed values of current and voltage give the true characteristic of the amplifier.

From the curve giving the current as a function of the anode potential, the value of the anode potential can be determined for which the current is reduced to zero. This potential, of course, depends upon that of the grid. By putting I equal to zero in equation (6), and $\gamma = \frac{1}{\mu_0}$ we get

$$\epsilon = -\left(\frac{E_B}{\mu_0} + E_c\right)$$

Once μ_0 and ϵ are known, the current can be plotted against the expression

$$\left(\frac{E_B}{\mu_0} + E_c + \epsilon\right)^2 \qquad (20)$$

Fig. 9 shows the results for one particular type of tube. In this case the grid had a constant negative potential equal to ϵ. Hence the current was simply plotted as a function of E_B. The straight line gives the relation between E_B^2 and the anode current. It is seen that the parabolic relation of the fundamental equation (6) is obeyed with sufficient accuracy.[11]

VI. Characteristic of Circuit Containing Thermionic Amplifier and Ohmic Resistance in Series.

In discussing the behavior of the thermionic amplifier in an alternating current circuit, we shall make two assumptions:

First. The alternating current established in the circuit $FPER$ (Fig. 4) is a linear function of the voltage impressed upon the input circuit FGE_c. This implies that the power amplification is independent of the input. This is the condition for an ideal amplifier.

Second. The thermionic amplifier shows no reactance effect. This implies that if the amplifier be inserted in a non-inductive circuit, the power amplification produced is independent of the frequency.

No proof is needed to establish the validity of the second assumption. The first is, however, not true except under certain conditions, and it remains to determine these conditions and operate the amplifier so that they are satisfied. Let the external resistance of the output circuit FPE (Fig. 4) be zero, and the resistance of the current-measuring device negligibly small compared with the internal output impedance of the amplifier itself.

Under these circumstances E_B, which denotes the potential difference between filament and anode, is independent of the current in the circuit FPE, and always equal to the voltage E of the battery in the circuit. Hence, if the current be plotted as a function of E_c, the potential difference between filament and grid, the parabola given by equation (6) and Fig. 5 is obtained.

If, now, the potential of the grid be varied about the value E_c equal to cf (Fig. 5), it is obvious from the curve that the increase, ab, in current to the anode due to a decrease, oa, in the negative potential of the grid is greater than the decrease $a'b'$ in current caused by an increase, oa', in the negative grid potential. In this case, the output current consists of the following parts: Let the alternating input voltage superimposed upon E_c be $e \sin pt$, then

$$I_a = \alpha(\gamma E_B + E_c + \epsilon + e \sin pt)^2. \quad (8)$$

Expanding this, we get

$$I_a = \alpha(\gamma E_B + E_c + \epsilon)^2 + 2\alpha(\gamma E_B + E_c + \epsilon)\, e \sin pt + \frac{\alpha e^2}{2} \cos(2pt + \pi) + \frac{\alpha e^2}{2}. \quad (21)$$

The first term represents the steady direct current maintained by the constant voltages E_B and E_c when the input voltage e is zero (equation 6). The second term gives the alternating output current oscillating about the value of direct current given by (6). It is in phase with and has the same frequency as the input voltage. When using the device as an amplifier, this is the only useful current we need to consider.

The first harmonic represented by the third term is present, as was to be expected in virtue of the parabolic characteristic. The last term, which is proportional to the square of the input voltage, represents the change in the direct current component due to the alternating input voltage, and is the only effective current when using the device as a radio wave detector.

If a direct current meter were inserted in the output circuit, it would show a current which is greater than that given

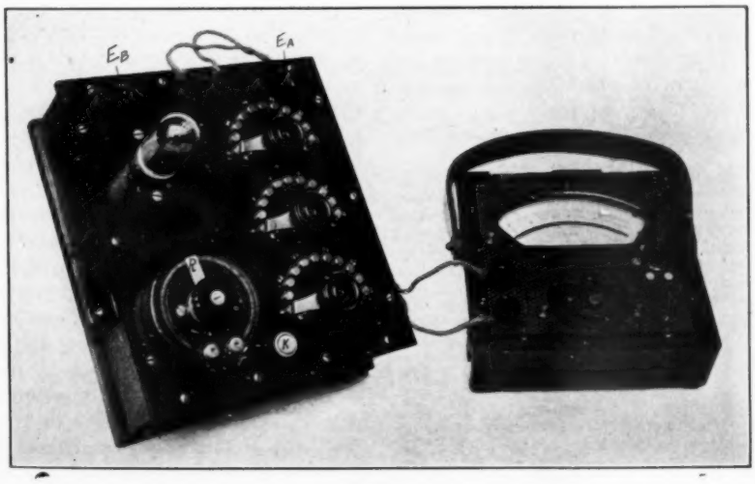

Fig. 8.

[11] For further results of these experiments, see "Phys. Rev.," (2), 12, 186, 1918.

by equation (6) by an amount equal to $\frac{a e^2}{2}$, the last term of equation (21). This is the state of matters when the device works into a negligibly small resistance.

If, on the other hand, the output circuit contains an appreciable resistance,[12] R, the voltage E_B between filament and plate is not constant, but is a function of the current, and an increase in the grid potential sets up a potential drop in the resistance R, with the result that E_B decreases, since the battery voltage E is constant. E_B is now given by

$$E_B = E - RI. \qquad (22)$$

In order to obtain the characteristic of the circuit containing the tube and a resistance R, let us substitute (22) in (8): $I_c = a\,[\gamma\,(E - RI) + E_c + \epsilon + e\sin pt]^2$ and put $\gamma E + E_c + \epsilon = V$. This gives

$$I_c = \frac{1 + 2a\gamma R\,(V + e\sin pt) - \sqrt{1 + 4a\gamma R\,(V + e\sin pt)}}{2a\gamma^2 R^2} \qquad (23)$$

This expression can be expanded into a Fourier series:

$$I_o = \begin{cases} \left(\dfrac{1 + 2a\gamma RV - \sqrt{1 + 4a\gamma RV}}{2a\gamma^2 R^2}\right) \\ + \left(1 - \dfrac{1}{\sqrt{1 + 4a\gamma RV}}\right)\dfrac{e}{\gamma R}\sin pt \\ + \dfrac{(-1)^{n+1}\,2^n\,\lfloor(2n-1)\,a^n\,\gamma^{n-1}\,R^{n-1}\,e^{n+1}\sin^{n+1}pt}{\lfloor n+1\,(1+4a\gamma RV)^{2n+\frac{1}{2}}} \end{cases} \qquad (24)$$

From this it is seen that the rate of convergence of the series increases as R is increased. Actual computations show that when the tube is made to work into an impedance equal to or greater than that of the tube, the harmonic terms become negligibly small compared with the second term of (24), which is the only useful term when using the tube as an amplifier, so that we can assume that the amplification is independent of the input voltage.[13]

When the tube works into a large external resistance it can show a blocking or choking effect on the current. This is seen from the following: The voltage E_B which is effective in drawing electrons through the grid to the anode is given by equation (22). If now the current be increased, not by increasing the electromotive force in the circuit FPR (Fig. 5), but by increasing the potential difference between filament and grid, the current I increases, while E, the electromotive force in the plate circuit, remains constant, from which it follows that E_B must decrease while E_c, the grid voltage, increases.

The result of this is that more electrons that otherwise would have come through the grid to the anode, are now drawn to the grid. If the input voltage becomes large enough, the anode circuit FPR may be robbed of so many of its electrons that no further increase in current in the anode circuit results no matter how much the grid voltage is increased. Under these conditions, equation (24) does not apply. Its application is limited to the conditions stated by equations (25) and (26).

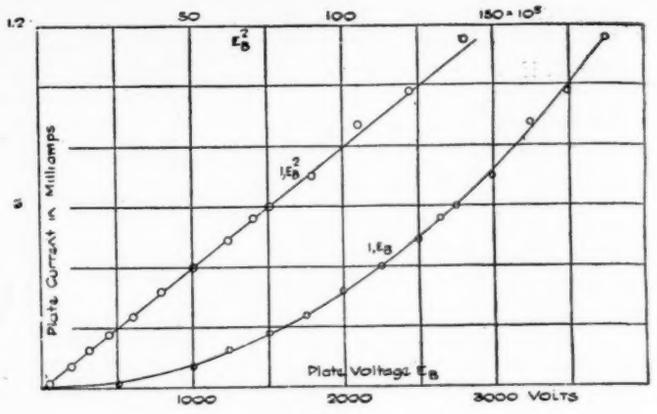

Fig. 9.

Even if the series represented by the last term of equation (24) were zero, distortionless transmission can only be obtained if the input voltage is kept within certain limits.

Let the input voltage, $e\sin pt$, be superimposed upon the negative grid voltage, E_c (Fig. 5). Theoretically speaking, one condition of operation is that the grid should never become so much positive with respect to the filament that it takes appreciable current, for if this happens the current established in the grid circuit would lower the input voltage, and therefore the amplification. In actual practice the extent to which the grid can become positive before taking appreciable current depends upon the value of the plate voltage and the structure of the tube.

We can, therefore, state that a condition for distortionless transmission is $e \leqq |E_c| + |g|$, where g is the positive voltage which the grid can acquire without taking enough current to cause distortion.

Another condition is that the input voltage must not exceed the value given by df (Fig. 5); otherwise the negative peaks of the output current wave will be chopped off. Now cd is given by $\gamma E_B + \epsilon$. This is obtained by equating the current I to zero in equation (6). We therefore have the conditions:

$$|e| \leqq |E_c| + |g|, \qquad (25)$$
$$|e| \leqq |\gamma E_B + \epsilon| - |E_c|,$$

or when the tube is working at full capacity—that is, when operating over the whole curve,

$$e = |E_c| + |g| = |\gamma E_B + \epsilon| - |E_c|. \qquad (26)$$

It may be remarked here that when using the tube as an oscillation generator, these limits are not obeyed. From equation (12), it is seen that the impedance R_o of the tube is independent of the input voltage $e\sin pt$. This is, however, true only as long as the characteristic is parabolic. Referring to Fig. 5, if the input voltage oscillates about the value f, the slope of the tangent at o is a measure of the impedance, in fact, it is μ_o divided by the impedance (equation 15).

Since the characteristic is parabolic, it follows that the secant through $b\,b'$ is always parallel to the tangent at o as long as $oa = oa'$ (equal to the input voltage e). The impedance can, therefore, be obtained by taking the slope of the secant through the maximum and minimum current values.

If now the tube works beyond the limits of the parabolic characteristic, such as along the curve OAB (Fig. 2) the slope of this secant does not remain constant for all values of the input voltage, so that the impedance of the tube is not independent of the strength of the oscillations but increases with it, the minimum impedance being obtained when the oscillations are infinitely small. This is what happens when the tube operates as an oscillation generator.

[12] The insertion of a suitable resistance in the output circuit to strengthen out the characteristic and so reduce distortion was, I believe, first suggested by Dr. Arnold, who also showed experimentally that distortion is almost negligible when the external resistance is equal to the impedance of the tube.

[13] In this connection I want to point out that although the parabolic relation used here represents the characteristic of the tube with sufficient accuracy when using the tube as an amplifier, and indeed with quite a good degree of accuracy, as shown by the experimental curves, yet the approximation is not close enough to represent accurately the second and higher derivatives of the characteristic, and therefore, too much reliance should not be placed on the actual values of the several harmonic terms represented by the last term of equation (24). This equation is merely intended to show, as it does, in a general way how the insertion of a resistance in the output circuit of the tube tends to strengthen out the characteristic.

Part of the energy in the output circuit is fed back to the input circuit, thus increasing the strength of the oscillations in the output until the tube works beyond the limits of the parabolic characteristic. The impedance of the tube is thereby increased, and this increase continues until the impedance acquires the maximum value capable of sustaining the oscillations, consistent with the degree of coupling used between the output and input circuits.

It is readily seen that the current obtained in the output is not a single pure sine wave, but contains a number of harmonics as well. The extent to which these harmonics influence the current values obtained, when the latter is measured simply by the insertion of a hot wire meter in the output circuit, which, of course, measures the total current, depends on the degree of coupling as well as the constants of the output circuit.

These considerations must be borne in mind when dealing with the alternating current output power obtainable from an oscillation tube. The only useful power is, of course, that which is due to the fundamental.

(*To be continued.*)

Prescribes New Accounting System

Nebraska State Railway Commission Issues Order that All Companies Having Annual Operating Revenues of $50,000 or Less Keep All Books and Records According to System It Prescribes—Salient Points Described

The Nebraska State Railway Commission has issued an order upon all of the telephone companies in that state having an annual operating revenue of $50,000 or less, requiring them to keep all accounts and books of record according to a system devised by its accountant, U. G. Powell.

This order follows up a finding and decree entered last February, but which had not been put into effect for the reason that it was necessary to prepare and have printed and in stock the necessary books and blanks. In the meantime Mr. Powell has revised some of his original drafts and forms.

This action was taken because experience had shown the commission that in order to properly administer its functions as a rate-making body, it was necessary to have the data at hand upon which to build up findings.

Many of the companies, especially the smaller ones, when it came to a rate hearing, were unable to supply the necessary data with regard to costs and original investments. This militated against doing justice to many of them. The few books and records they were able to produce, which oftentimes included merely the stubs of check books, did not reveal the facts, and it was often evident that proper charges against capital and sacrifices of officers, directors and stockholders had not been noted with sufficient clearness to make data acceptable.

Simplicity the Aim.

Mr. Powell states that it has been the aim, in the preparation of the telephone accounting system prescribed, to make it as simple as possible and at the same time furnish the necessary information for making the annual report of the companies to the commission and to the Interstate Commerce Commission.

"In the book of instructions that we are sending out," says Mr. Powell, "we have materially condensed the system for the smaller companies, where it is realized that expert bookkeeping talent is not available or possible. These instructions have been so drawn that I believe anyone with ordinary bookkeeping knowledge will be able to determine the different accounts into which the property should be divided as to charges for betterments and additions to the plant, the proper accounts to be credited to operating revenues and the proper operating expense accounts to be charged."

For convenience, the commission has adopted the same method of determining the different classes as adopted by the Interstate Commerce Commission, with the exception that there is a further subdivision of accounts between Class C and D companies, and Class E companies as another class. The divisions are as follows:

Divided Into Five Classes.

Class A: Companies having average annual operating revenue exceeding $250,000.

Class B: Companies having average annual operating revenues exceeding $50,000, but not more than $250,000.

Class C: Companies having average annual operating revenues exceeding $15,000 but not more than $50,000.

Class D: Companies having average annual revenues exceeding $5,000, but not more than $15,000.

Class E: Companies having average annual revenues of $5,000 or less.

The system of accounts contains these general classifications of accounts: Balance sheet accounts; plant and equipment accounts; income accounts; operating revenue accounts; and operating expense accounts.

Special examiners will be sent out to assist companies in establishing the uniform system prescribed for the three lower classes of companies. Each company is to be supplied by the commission with all books and forms. The contract for these was let to the lowest bidder, and all of the forms are copyrighted in the name of the printing company so that they may not be used elsewhere without permission. No companies are permitted to install the system until authorized to do so.

To further facilitate the handling of the new system, the commission's accounting department proposes to prepare and mail monthly to all companies affected by the order, which are Classes C, D and E, a copy of all questions relative to the system and the answers, so that all companies may have the advantage of all questions asked as to its operation.

The Depreciation Reserve.

The instructions relating to the proper method of keeping a depreciation reserve, which is usually an unknown quantity with the smaller companies, contain, says Mr. Powell, some new definitions and distinctions. As used in this system, it is intended to represent the loss in operating efficiency of a telephone property from any cause whatsoever, such as wear and tear, obsolescence, public regulation, changes in the art, or any other cause which tends to depreciate the working efficiency of any part of the system.

Mr. Powell points out that it is not for the purpose of ascertaining values that this depreciation reserve is set up, but for the purpose of continually maintaining all of the component parts of a plant of a certain type consisting of a given number of subscribers' stations. "By this we mean, (a) that if a switchboard of 300-drop capacity, before the war, was installed at a cost of $1,200, and by reason of fire or some other unavoidable cause, it becomes necessary to replace it with a board of the same capacity and type, (under war prices) at a cost of $1,500, the entire cost of replacing the new board should be charged to depreciation reserve, and no part thereof to plant account.

Let us suppose that (b) the original board cost $1,200, and at the time it became necessary to replace it with a board of the same type and capacity, the cost is $900. Then the $900 would be charged to depreciation reserve amount. Let us suppose again that (c) it became necessary to replace the 300-drop board with a board of 400 drops and that its cost is $2,000. Then in that event, $1,200 of the $2,000 expended should be charged

The Dial Handles All Calls on The C. A. X.

(Community Automatic Exchange)

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Please tell the Advertiser you saw his Advertisement in TELEPHONY.

SUBSCRIBERS served by the Community Automatic Exchange (C. A. X.) make all calls with the Automatic Dial.

For local connections, to other lines or to parties on their own line (number 45, for instance), they lift the receiver from the hook, turn the dial from "4" and then from "5" and the connection is made.

For calls to other towns, to toll points or for information, they call regular, assigned numbers, which connect them to the switchboard in the Company's main exchange.

Using the Dial insures quick, accurate service, 24 hours a day, every day in the year.

Using the Dial makes operators at the C. A. X. unnecessary. There are no salaries to pay for switchboard girls.

The C. A. X. telephones are of the common battery type. There are no dry cells to renew.

The C. A. X. equipment is simple and easy to maintain. An occasional visit by your present maintenance man is all that is needed to keep the apparatus operating properly.

The C. A. X. reduces operating costs to the minimum and gives your subscribers the best service skill can provide.

Let us tell you what the C. A. X. is doing for others and what it can do for you.

CTRIC COMPANY

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to depreciation reserve and $800 to plant account.

The primary purpose of the depreciation reserve in this accounting system is to actually provide, and be able to account for, a reserve from money received from operating revenues, for the perpetual maintenance of a telephone property of a certain type and a number of subscribers' stations.

The basis of 9 per cent of the cost of the depreciable property, as provided in this system of accounting, has been arrived at after extensive studies covering a large number of telephone exchanges and a period of 12 or 15 years. Most of these were Bell exchanges, and a recent rechecking shows that, even with war prices prevailing, this is a fair average.

This method of providing for perpetual maintenance of a property has been adopted by the commission for the purpose of being able to charge for operating expenses a certain amount each year which, if properly expended, will guarantee to the public, service of a certain quality dependent upon the class of service the telephone company undertakes to furnish to its patrons.

If the company desires to use money in the depreciation reserve for the purpose of building new property, or for improvements to the present plant, application must be made to the commission in writing, stating the amount of money the company desires to expend and the additions or betterments for which it will be spent. The depreciation reserve must not be used for any purpose except maintenance without first having secured the permission to borrow from the fund.

Explanation of Terms.

The word "repairs," it is explained, as used in the operating expense group of accounts in the book of instructions, is intended to represent not only ordinary current repairs, but repairs of all kinds, such as removals, reconstruction of worn-out plant, replacement of property on account of obsolescence, or any other cause which necessitates the expenditure of money to replace, renew or reconstruct existing property.

The new rules and forms require the classification of all recovered materials into "good," "junk" and "worthless."

An example of "good" is found in the case of a 25-foot pole which for some reason it becomes necessary to replace with another pole of the same length, and by cutting down the old pole, a 20-foot pole may be recovered. Suppose that this 25-foot pole originally represented a cost of $3, and that at present the price for a 20-foot pole is $2, then the old pole should be taken into the material account as a good 20-foot pole at a cost of $2, and when the same pole goes into the plant as a 20-footer, either as maintenance, or additions and betterments, it should be charged at a cost of $2.

The word "junk" is used to represent the estimated salable price of any material recovered from the property when sold.

The word "worthless" is to represent the complete loss of any given piece of property. Suppose the pole is struck by lightning and cannot be used as a cut-down pole and is not worth selling as junk, it should be considered worthless and the proper operating expense account should be charged with the total cost of replacing it, if it be replaced with a pole of like size.

Necessity for Proper Plant Accounting.

Emphasis is laid on the necessity of keeping a plant account in such form that track may be kept of the material recovered from plant displaced. All material recovered and put into the storehouse or material yard, should have an estimated value placed on it by some one competent to determine the amount of remaining value in the property recovered. This amount should be entered in the material book, so that when it is again used for maintenance or additions and betterments, the cost at which it was taken into account when it was recovered will be used in its new position.

The instructions require the Classes C. and D companies to divide their balance sheet account into these subdivisions:

Assets: Plant and equipment, other property, securities owned, cash, notes receivable, due from subscribers and agents, accounts receivable, materials and supplies, reserve funds, treasury stock, prepayments and other debit accounts.

Liabilities: Capital stock with preferred and common divisions, funded debt, notes payable, accounts payable, accrued liabilities not due, depreciation reserve, advance payments by subscribers, other credit accounts, surplus reserves appropriated, profit and loss.

Plant and Equipment Account.

Plant and equipment account subdivisions: Intangibles, land, central station buildings, all other buildings, exchange switchboards, office furniture, city subscribers' station equipment, farm subscribers' station equipment, city pole lines, city aerial wire, city aerial cable, city underground cable, farm pole lines, farm aerial wire, toll pole lines, toll aerial iron wire, toll aerial copper wire, booths and fixtures, toll switchboards, teams, harness, wagons and motor vehicles, tools and machinery, construction in process, plant and equipment purchased.

There should be charged to "construction in progress" all expenditures made in the building or acquisition of plant and equipment when such expenditures have not been charged to plant and equipment accounts, because of the work being incomplete. When a "going" or completed telephone plant is purchased or constructed under contract, the cost of it shall be charged to the "plant and equipment purchased" account until such time as a basis may be determined upon for distribution of the cost over the proper accounts.

Operating revenue accounts subdivisions: City subscribers' service revenues, farm subscribers' service revenues, switching revenues, pay station revenues, toll revenues, messenger service, sundry sales, other miscellaneous revenues, licensee revenues, credit, and licensee revenues, debit.

The first item should be credited with all revenues accruing from the transmission of local messages within the same exchange area. An exchange area is that referred to and usually described in contracts with subscribers as that within which local service is furnished at the rates specified. This account should include rentals from city subscribers, private branch exchanges, extension sets and bells, extra directory insertions, installation and cancellation charges when billed against subscribers, rents from attachment to exchange poles and other rents of exchange property within the city limits.

The Toll Revenues Account.

Toll revenues account should include all revenue collected for the transmission of messages between different exchange areas, such as revenues from messages transmitted wholly over the company's lines in the differing areas, from all subscribers or pay stations, revenue from those transmitted only partly over the company's lines, and commissions allowed the company by others on messages the collection for which are made by the collecting company; rents for toll lines leased, rents from attachments to toll poles and other rentals of toll property or revenues accruing from toll line operations. Charge to this account payments to other companies for toll service, correction of overcharges, authorized refunds on account of failure in transmission and other corrections affecting toll revenue.

There are three divisions of the operating expense accounts plant, traffic and commercial—subdivided as follows:

Plant: Repairs to city lines, repairs to farm lines, repairs to toll lines, repairs to toll switchboards, repairs to booths and fixtures, repairs to exchange central office equipment, repairs to city subscribers' station equipment, repairs to farm subscribers' station equipment, city station removals and charges, farm station removals and charges, depreciation of plant and equipment, repairs to buildings and fixtures, general equipment repairs.

Traffic: Exchange operators' wages, toll operators' wages, power expense and other traffic expenses.

Commercial: Salaries of officers, salaries of clerks, rents, stationery and printing, office supplies and expenses, other general expenses.

In the instruction as to "depreciation of plant and equipment" account, it is directed that there shall be charged to this account and credited monthly to the depreciation reserve account, the difference between the total of the monthly maintenance expenses and one-twelfth of the annual charge for maintenance and depreciation of plant and equipment as described thereunder.

If the actual expenditures for maintenance exceed the monthly allowance provided by the depreciation reserve account, the difference should be credited to this account and depreciation reserve charged in the same amount.

To "exchange operators' accounts" shall be charged the pay also of chief operators, supervisors, local operators, information and all other operators save toll, whose pay is all that goes into toll operators' charge account.

Where the manager or secretary of the company acts as lineman, the amount of salary for the time so engaged must be charged to the proper plant or maintenance account applicable to the service in which they are engaged.

The income account is intended as a monthly or as an annual clearing account for all revenues and expenses.

On the credit side is the income clearing account, in which all operating expenses are charged and all operating revenues are credited; the "other operating revenues," to be used where the company conducts operations such as lighting, water, power or manufacturing, and miscellaneous income, which includes interest receivable on mortgages, bonds or notes owned by the company, dividends receivable from other companies and rents receivable from any part of plant leased to others.

On the debit side, are carried expense of operations other than telephone, taxes accrued, interest accrued, miscellaneous charges to income and dividends declared.

A simpler form requiring fewer books and less bookkeeping is provided for the Class E companies. The plant and equipment accounts is reduced from 23 to nine subdivisions, and similar reductions are made in others. Attached to the instructions are explanations of just what each book is to be used for, how it is to be used, and what results are expected from that use.

Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchises, Rates and Service

Proper Switching Charge Up Before Nebraska Commission.

What constitutes a proper standard switching charge was the subject of a vigorous debate recently held before the Nebraska State Railway Commission between representatives of various farm lines switched by the Lincoln Telephone & Telegraph Co. and of the company.

The company asked the commission for permission to increase switching rates at the Syracuse, Humboldt and Brock exchanges from 40 cents to 50 cents, and that at Douglas from 30 to 50 cents. It also desired validation of 50-cent rates it had been charging at Edgar, Exeter, Geneva, Grafton, Louisville, Milligan, Nebraska City, Ong, Pleasant Dale, Shickley, Strang, Superior and Weeping Water. The predecessor companies had made switching charges at these points, but had never filed them with the commission. The company switches at 14 other points, but these rates had been approved at 50 cents by the commission.

W. L. Lemon, the auditor for the company, submitted a number of studies of costs for switching at the various exchanges. These showed that the net cost in each instance ran close to 50 cents a month. The expenses, generally speaking, are pro-rated on a basis of the proportion of stations switched to the number of subscribers' stations on the exchange, with variations where this does not represent a proper split of expense. The stations switched are credited with their proportion of toll revenues, and where the toll business from the switched lines is light this increases the cost of switching.

The rates were protested by the representatives of a number of farm lines on the exchanges in question. Some complained of the quality of the service and expressed a willingness to pay more if better service were given, but the company contended that the inadequate equipment of the farm lines was largely responsible.

Some of the farm line company representatives admitted that they were renting telephones to tenants on farms, and in several instances the only cost to the owners of the lines and instruments was the upkeep, the rentals paying all costs. One short trunk line company manager admitted to making 400 per cent on the investment, but later changed this to 25 per cent when the elements of cost were made plain. This will probably result in these mutuals being brought under commission regulation, which applies where telephones are rented.

Lincoln Company Seeks Rate Increases in 64 Exchanges.

The Lincoln Telephone & Telegraph Co. has made application to the Nebraska State Railway Commission for permission to increase rates on 64 of its 111 exchanges. The company represents that it is confronted with the necessity of immediately increasing the wages of its electrical workers from $3.25 a day to $4 a day, to meet the Nebraska standard of wage in that branch of the trade.

This will involve an additional cost of $10,000 a month, and as the year's operation, from March 31, 1918 to March 31, 1919, left the company with a deficit of $25,000, after paying dividends, it desired an emergency order issued authorizing the increases suggested to be effective July 1. The commission refused to grant as speedy a hearing as was desired, on the ground that all of the communities affected should be given an opportunity to present a protest if they desired. The case was set for June 2.

The application was presented by George K. Gann, traffic superintendent, in the absence from the state of the other higher-ups of the company. Mr. Gann told the commission that the rates proposed would increase revenues $11,000 a month, but that this estimate would probably have to be revised in view of the possible loss of revenue from cancellations because of the higher rates. The company has about 1,000 stockholders, 500 of whom are women, many of whom are dependent in large part for the dividends received upon their stock holdings.

The rates asked for are merely tentative and suggestive, made after a study of what the traffic would bear. The company was granted an increase of rates last fall for a period of six months, which was recently extended until the end of the present year. Only a few of the exchange rates then raised are included in the present application. In Lincoln the residence rate was increased 25 cents in 1918. Another 25-cent increase is asked for, bringing them up to $2.75 and $2.25. An increase of $1 is asked in business rates, making them $7 and $5.50 a month. Fifty cents a month is added to business P. B. X. telephones and 25 cents to hotel P. B. X.'s.

The petition sets up that the company operates 60,000 telephones in a territory of about 425,000 population, in which 20,000 miles of toll lines are operated. It employs from 1,200 to 1,500 persons, the number now on its payroll being 1,265. Other industries in the state are paying higher wages than its plant and linemen are receiving, and this has not only threatened to deplete the working force, but has already done so.

The petition states, further, that, at the present time there is a scarcity of both skilled and unskilled labor, that the cost of living does not show any indications of going down and that business necessity and justice to the men require that the wage increase should be granted them.

It is stated that the company has outstanding bonds of $1,200,000 bearing 5 per cent, preferred stock of $3,957,000 drawing 5 per cent and $2,111,000 of common stock that formerly paid 8 per cent but which for the past seven years has paid but 7, an average return of 5.6 per cent upon the securities, which represent the actual investment in the properties, a return much less than the present market value of money. The increase asked for is but 17 cents a telephone.

The application asks for an increase of $1 a month on business rates on the exchanges at Auburn, Adams, Brock, Cook, Pleasant Dale, Johnson, Murray, Nemaha and Otoe.

Seventy-five cents a month business increases—David City, Fairbury (both individual and party line), Ashland, Friend, Geneva, Hebron, Nebraska City, Osceola, Plattsmouth, Seward, Stromsburg, Superior, Sutton, Tecumseh, Wahoo, Wilber, Wymore and York.

Fifty cents a month business increases—Beatrice, Beaver Crossing, Belvidere, Benedict, Bennet, Bradshaw, Brainard, Bruno, Burr, Carleton, Cedar Bluffs, Ceresco, Clatonia, Clay Center, Colon, Cordova, Crab Orchard, DeWitt, Dorchester, Douglas, Dunbar, Dwight, Edgar, Elk Creek, Elmwood, Exeter, Fairfield, Fairmont, Filley, Garrison, Grafton, Gresham, Harvard, Humboldt, Ithaca, Louisville, Lushton, McCool, Mead, Milligan, Nehawka, Octavia, Ong, Panama, Plymouth, Polk, Saronville, Shelby, Shickley, Steinauer, Sterling, Strang, Syracuse, Talmage, Thayer, Tobias, Utica, Waco, Weeping Water and Yutan.

Twenty-five cents business increases—Red Cloud, Garland, Milford, Tamora.

Fifty cents a month residence increases—Auburn (party line), Fairbury, Brock, Brownville, Johnson and Nemaha.

Twenty-five cents residence increases—Fairbury, Fairmont, Friend, Hebron, Osceola, Red Cloud, Stromsburg, Wilber, Johnson, Nemaha, Adams, Ashland, Clatonia, Cook and Otoe.

A fifty-cent farm line increase was made at Auburn, and 25 cents on the following exchanges—David City, Fairbury, Fairmont, Friend, Belvidere, Brook, Carleton, Cook, Geneva, Hebron, Hastings, Johnson, Nebraska City, Oscela, Plattsmouth, Seward, Stromsburg, Superior, Sutton, Tecumseh, Wahoo, Wilber, Wymore and York.

Unusual Complaint Against Burleson Move Charges.

Harry Widman, a farmer who has a telephone connection on the Mead exchange of the Lincoln Telephone & Telegraph Co., is in rebellion over the order of Postmaster General Burleson that every company must collect the scheduled charge for each telephone removal or pay the charge itself. Widman's complaint is an unusual one.

Some months ago he completed a new house not far from his old one. Being thrifty and mechanically inclined, he did not trouble the company to come out and move the telephone from one house to the other. When he was in town he borrowed some wire from the repairman, and changed it himself. It was successful, although he had to buy some cells to supplant those that went dead on him. Now the manager has presented a bill for $4.50 for the telephone removal, and has threatened to cut off service if not paid.

Widman wants to know "how about it?" He says that last year the wind "blowed" four poles into his oat field. He reset them himself, and adds, "but nobody has offered to pay me any service connection charges therefor." In order to prove he is in earnest he asks the commission if there is any law that will make the company raise its wires so his hay stacker can go under.

Indiana Restraining Order Continued Indefinitely.

The temporary restraining order obtained on April 30 by Ele Stansbury, attorney general of Indiana, in behalf of the Indiana Public Service Commission, to prevent the Southern Telephone Co. of Indiana from increasing rates and tolls as ordered by Postmaster General Burleson, was ordered continued indefinitely by Judge Philip C. Gould, of the Vanderburg circuit court at Evansville, Ind., Thursday, May 15.

It was agreed by Walton M. Wheeler, an Evansville attorney, who appeared for the attorney-general, and John W. Brady, president and general counsel for the Southern Indiana Telephone Co. of Indiana, before the convening of court that the only thing to do was to continue the restraining order indefinitely in view of the fact that the Supreme Court of the United States is expected to pass on the same question in a short time. As a result of the agreement no arguments were presented.

When the restraining order was issued against the Southern company, Charles W. Clarke, manager of the Evansville exchange, announced that the order of the court would be obeyed. The new rates were to have gone into effect May 1, but bills sent out by the company on that date were at the old rates.

The Southern company operates in about 30 towns and cities in the southern part of Indiana, as far east as Floyd county. Some of these towns were not included in the order to raise the rates and this was explained by George G. Hall, general manager of the company, who said that Mr. Burleson had not yet passed on all lists of the exchanges of the local company, but that it was the purpose to raise the rates in all the exchanges.

Rate Increase Denied—Earnings Invested in Plant.

The Ontario Railway & Municipal Board at Toronto, Can., on May 15, denied the application of the Erie Telephone Co., Ltd., for a 25 per cent increase in rates. The board ruled that it is the duty of the shareholders and not the subscribers to provide the capital necessary to carry on their undertaking.

"The statements filed with the board show that there has been expended upon plant and equipment of the Erie company since its inception in 1906 the sum of $84,053, of which amount $51,303 has been contributed from net earnings," the opinion states. "It would therefore appear that over 60 per cent of the capital had been furnished by the subscribers out of the rentals and tolls paid by them.

"This is a record unprecedented in the history of the telephone systems within the jurisdiction of this board.

"The application cannot be sustained, in view of the facts presented, upon the ground that the applicant's revenue at existing tariff rates is insufficient to pay operating expenses, set aside depreciation reserve and provide a reasonable interest upon the investment. If, on the other hand, the purpose of the proposed increase is to enable the applicant to charge rates sufficiently high to furnish additional profits to be used in new revenue-earning construction and extensions the application must be denied for the reason that it is the duty of the shareholders, not the subscribers, to provide the capital necessary to carry on their undertaking."

Watkins (Minn.) Company to Increase its Rates.

The Watkins Telephone Co. was given permission by the Minnesota Railroad & Warehouse Commission, May 19, to increase its local and rural rates at Watkins, Minn., as follows: Individual line business telephones, from $1.50 to $2 per month; individual line residence, from $1 to $1.25 per month; rural multi-party, from $1 to $1.25 per month.

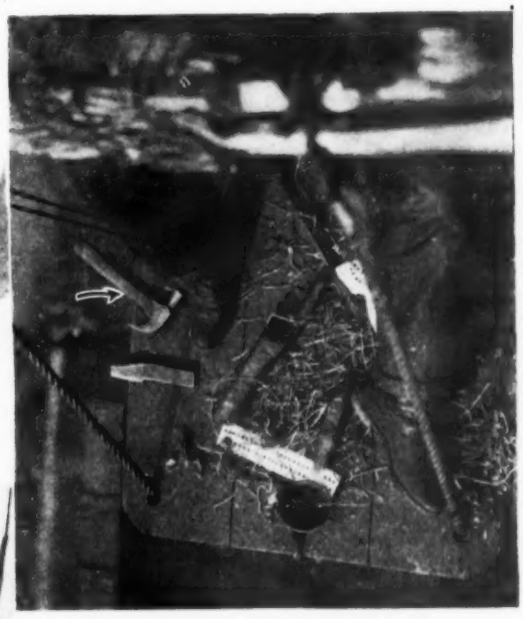
The company operates a local telephone exchange at Watkins, Minn., consisting of 30 business telephones and 33 residence

Watch Out for the Man Below!

This Page of Illustrations Was Published Recently in the Southwestern Telephone News and Is Being Presented to "Telephony's" Readers Through the Courtesy of that Publication.

Boiling paraffin is no joke. A ladle handle catches on a platform and the man below gets scalded.

The man above carries a monkey wrench in his belt. See. The guy wire is releasing it. "Man below, watch out!"



It's mighty careless to leave tools lying on a splicer's platform. Bill moved his foot and the man below didn't even know what hit him.

Watch the hammer slide off the ladder and bean Bill.

Ladders are dangerous both to man above and man below. To the left is shown a ladder placed nearly vertical and without safeguard at the base. If John goes over backward, he'll crash into some "hot stuff." To the right we see Safety First.

telephones within the village, and 126 rural telephones in the vicinity of Watkins. The present owner, C. E. Fleming, purchased the property March 1, 1918.

Considerable reconstruction work on the rural lines has been done during the past year and the material has been ordered to replace the greater portion of aerial wire construction now in the village with aerial cable. An exhibit covering an inventory and appraisal of the property was submitted by the petitioner, together with statements of the operating revenues and expenses for the past two years.

Although the operating expenses have been very reasonable, the property is operated at a loss. Increases in the salaries of operators, made effective April 1, 1919, amount to over $300 per year.

Upon consideration of the facts in the case, the commission finds the rates petitioned for to be fair and reasonable, and that they will not yield more than sufficient revenue to take care of the necessary operating expenses, depreciation and a fair return upon the investment.

Allowance Made for Earnings Put into Plant in Rate Case.

The Citizens Co-operative Telephone Co., of Plankinton, is authorized by the South Dakota Railroad Commission, in a ruling handed down May 1, to increase its rates for main line business service from $1.50 to $2 per month, main line residence service, from $1 to $1.50 per month and, if the company desires to establish such service in its classification, to establish a party line residence rate of $1.25 per month.

It appeared from the record in the case that there is outstanding capital stock in the amount of $6,000, while the company claims a physical valuation of the property to be $12,000. In view of the fact that it was shown that it has been the practice of the company to forego the payment of dividends and invest its surplus earnings into plant, the commission fixed $10,000 as a fair value of the property for rate-making purposes.

With the exception of its failure to properly account for capital charges, it was found that the accounts and records of the company have been well kept.

Germans Try to Bar Use of English Over Telephone Line.

An important and pregnant question has been put up to the Nebraska State Railway Commission by E. F. Ferber, a citizen of Wynot:

"Why is it that the Germans are allowed to domineer over us Americans so now that we have won the war over Germany?"

Mr. Ferber is not referring to the Germans in Germany, but the Germans in the neighborhood of Wynot. When the war was on the county council of defense told them emphatically that they would not be permitted to converse over the lines in the kaiser's tongue. Although the commission, when appealed to by Germans in other parts of the state, ruled that no one had the power to forbid the use of that or any other language over the telephone, those who patronized telephone lines in the neighborhood of Wynot used English or didn't use the telephone.

As soon as the war was over the county council of defense dissolved. Then the Germans promptly came out of retirement, and became arrogant and domineering. In one of the mutual organizations that operates a line into Wynot there are 21 stockholders, eight of whom are Americans and 13 of German birth. The latter dominating the organization are reported by Ferber to have decided upon passing a rule forbidding anybody talking English or any other tongue than German over the lines. He desires the aid of the commission to prevent this being done.

He relates that the plan is to elect nobody but Germans to the offices and then to make the rule that whatever the majority decides shall be the will of the entire organization. The Germans cite the school meeting where they were told that as the majority had decided to bar German from the schools that "went." This is how Ferber tells it:

"The Germans in the meeting said nothing about building to Fordyce, but they said they are going to take up an equal share of the poles and wire of this line and build a line to Wynot so they can talk German or Americans will have to buy them new poles and wires. Can they do this? One of the Americans tried to explain that the war brought about the old trouble, and that if they would continue as before it will be all right, but the Germans are getting very numerous and delight to show their power. They are holding secret telephone meetings among themselves, and it is hard to tell just what they are up to."

Mr. Ferber suggests that they be denied any franchise to construct a line of their own.

Stockholders Ask Commission to Fire Company's Manager.

The Nebraska State Railway Commission has been asked by a stockholder of a telephone company in western Nebraska, to please come out and fire the company's manager.

The complaint says that the manager is a very unruly man, that he has so conducted himself that the officers of the company are afraid to fire him, that he has accepted a position in a store, paying $100 a month, but persists in hanging onto the $50-a-month job as exchange manager; that he has hired a little girl to do all of the operating and that the service has grown so bad that it cannot be continued.

Assumption Mutual Files Appeal from Commission Ruling.

The Assumption Mutual Telephone Co., of Assumption, Ill., has filed notice of an appeal to the circuit court of Sangamon county against the adverse ruling of the Illinois Public Utilities Commission on its petition for physical connection and interchange of service with the Central Union Telephone Co.

Company Attempts to Justify 40 Per Cent Dividend.

When a community is satisfied with the service given it and with the rates charged therefor, is it any particular business of anybody else whether the telephone company that is giving it is making more than the ordinary returns for public utilities? Although not in this language, it was in this form that the Burchard Telephone Co., summoned before the Nebraska State Railway Commission to explain how it was able to pay 40 per cent dividends in two successive years, answered.

The commission ordered the company to show cause why it should not, in view of these large dividends, and the failure of the company to expend a proper maintenance amount and its neglect to keep a depreciation reserve, order dividends suspended until these accounts were made good, to then fix a reasonable annual return and order the remainder expended or held in trust for patrons.

J. F. Cox, secretary and general manager, and A. S. Barclay, treasurer, appeared in answer to the summons. They said that the company was organized in 1905, with a cash capital all paid in and expended of $5,300. No dividends were declared for the first three or four years, the earnings being put back into the property in order to meet the demand for service. They estimated the present reproduction new value to be between $11,000 and $12,000.

The company serves a compact territory, with a minimum of wire mileage, and has been charging a flat rate of $1.25 for all classes of service, over a grounded system. The average dividend paid in the last 14 years has been 18 per cent, 40 per cent having been paid in 1917 and also in 1918. Mr. Cox maintained that the property was kept in good, serviceable condition, that the service given was satisfactory to the patrons and at rates that were not excessive and of which there was no complaint. He said he would be glad to have the commissioners invite complaints. He maintained that if the dividends were based on the actual investment it would be found that they were not excessive.

Mr. Cox said that the expenses were

lower than normal, and explained this on the ground that the company was fortunate in having a lineman, who took care of the entire exchange, along with members of his family, a combination that made it possible to reduce operating expenses below the average. In addition the officers donated much of their time, charging only $20 a month when $50 was the usual charge, and making no demand for repayment of necessary traveling expenses.

There are 45 stockholders, and between 250 and 300 stations served. He said that while the telephones and lines were 14 years old they were in good condition and the subscribers were satisfied. The company expected, if storm damage came, to pass a dividend to take care of that or any other extraordinary expenses. The only sum set aside for depreciation was $600 in Liberty bonds.

The commission took the matter under advisement, but expects to make further investigation and inquiry. In all orders issued in rate-making cases it has limited dividends, required the setting up of depreciation accounts and the expenditure of a definite percentage for maintenance.

Summary of Commission Rulings and Schedule of Hearings.

ILLINOIS.

May 20: Hearing at Springfield in the matter of the application of the Commercial Telephone & Telegraph Co. for authority to change rates for telephone service in the city of Olney. No. 8807.

May 20: Hearing at Springfield in the matter of the application of the Farmers Fountain Telephone Co. for authority to increase its rates in the village of Columbia and the city of Waterloo. No. 9051.

May 20: Hearing at Springfield in the matter of the proposed advance in rates for telephone service in Cuba by the Cuba Telephone Co. No. 9091.

May 20: Hearing at Springfield in the matter of the application of the Cumberland Telephone & Telegraph Co. for authority to increase telephone rates in Enfield, Equality, Elizabethtown, Norris City, Ridgeway, Golconda and Shawneetown. No. 9093.

May 21: Hearing at Springfield in the matter of the proposed increase in telephone rates at Knoxville by the Knoxville Farmers Telephone Co. No. 9078.

May 21: Hearing at Springfield in the matter of the proposed advance in rates for telephone service in Rushville by the Schuyler Telephone Co. No. 9090.

INDIANA.

May 22: Hearing at Indianapolis on the petition of the Citizens Telephone Co., of Decatur, for an increase of rates.

May 23: Hearing at Indianapolis on the petition of the Veedersburg Telephone Co., of Veedersburg, for an increase in rates.

MINNESOTA.

May 14: Akeley Telephone Co. authorized to increase its local and rural rates at Akeley, Minn., and vicinity and ordered to make repairs on its rural lines so as to furnish reasonable service.

May 19: The commission approved the application of the Harmony Telephone Exchange Co., of Harmony, Minn., to increase its rates.

May 19: The commission approved the application of the Watkins (Minn.) Telephone Co. for an increase in rates.

May 27: Hearing at Grand Meadow on the application of the Home Telephone Co. to increase its local and rural telephone rates in that village and vicinity.

May 28: Hearing at Eyota on the application of the Viola Telephone Co. to place an installation charge in effect at its Eyota exchange.

May 29: Hearing at Clearwater on the application of the Clearwater Telephone Co. to increase its local and rural rates in that village and vicinity.

NEBRASKA.

May 12: Complaint of J. B. Miller, of Geneva, against Lincoln Telephone & Telegraph Co., alleging that switching service is inadequate. Mr. Miller represents farm line company that has pending dispute with Lincoln company over a proposal to increase switching charges.

May 12: Application of the Cuming County Independent Telephone Co., of Wisner, for permission to make a charge of 25 cents a month for farm desk sets; evidence adduced and upon consideration thereof the commission grants permission to make rate of $2 a month gross and $1.75 net. Where companies refuse to give this service the commission does not require it because of the high maintenance cost and the fact that when one is out on a rural line the line is out. Where the companies request it they are given permission to offer this service at an increased rate.

May 12: Application of the Pawnee Telephone Co., of Pawnee City, for permission to issue $4,000 worth of stock for purpose of complying with recent order respecting installation of new switchboard and other facilities, filed.

May 13: Application of the Stella (Neb.) Telephone Co. for permission to establish extension set rates for business and residence service; on presentation and consideration of evidence the commission finds the request reasonable and that the company should have such revenue. It is therefore ordered that beginning June 1 the company shall be permitted to collect the following rates: Business extension sets, 75 cents; residence, 50 cents; extension bells, 25 cents.

May 13: Hearing on the application of the Nebraska Telephone Co. for permission to eliminate free service between Culbertson and Trenton. The evidence shows that the predecessor company, the Wray Telephone Co., had upon file with the commission a schedule showing a one-way free service, but that in practice many of the return calls went through without charge. The commission finds that one-way free service always overloads a line and as there was only a one-way free service published in the schedule, it orders that request for elimination be granted.

May 15: Application of the Lincoln Telephone & Telegraph Co. for permission to make increases in rates upon 64 exchanges, filed. The petition sets up that the company operated at a deficit of $25,000 the last 12 months, that it is now confronted by a demand of the men in the electrical department for an increase of approximately 25 per cent of wages, that it is necessary to maintain the service that this increase be granted in view of the higher wages other industries are paying and thus taking away the skilled and more efficient men, and that such increase is but justice to the men in view of the increased cost of living; the request being for rates varying from 25 cents to $1 a month on business telephones and from 25 cents to 75 cents on residence telephones. The company says it has immediate need of an increase of $10,000 a month in net revenue. The case was set for a hearing June 2.

May 15: Application of the Battle Creek (Neb.) Telephone Co. for an increase in farm rates by changing rate of discount for advance payments from 28 per cent where paid a year in advance to 10 per cent when paid three months in advance; company says that property is getting old and it is necessary for it to set up a reserve for replacement.

May 16: Application of the Ainsworth (Neb.) Telephone Co. for permission to increase exchange rates; hearing held, evidence adduced and matter taken under advisement.

May 16: Application of Bertrand, Neb., Telephone Co. for supplemental order with respect to rates upon certain rural lines; in view of evidence showing special costs thereon company is permitted to charge $12 a year for switching service.

May 16: Hearing upon order of commission to companies located at Falls City, Pawnee City, Odell, Diller, DuBois, Burchard, Steele City, Daykin, Chester, Blue Hill, Staplehurst and Surprise to show cause why toll rates should not be increased 25 per cent to eliminate discrimination existing because the connecting company, the Lincoln, had previously been given permission to make such increase; no protests entered.

June 10: Hearing at Brady on application of the Maxwell-Brady Telephone Co. for an increase in rates and consideration of inventory.

June 11: Final hearing at Gothenburg on application of Gothenburg Telephone Co. for increase in rates and consideration and comparison of inventory values made by representatives respectively of the commission and the company.

OREGON.

May 2: The commission issued an order refusing to allow the application of the Pacific Telephone & Telegraph Co. for an increase of 27 per cent in telephone exchange rates on the company's lines in Oregon. Slight increases in rates at some points were granted by the commission.

In a concurring opinion Commissioner Williams declared that Postmaster General Burleson and not the telephone company, was the applicant for increased rates.

May 12: The commission, upon complaint of the Home Telephone Co., of La Grande, Ore., ordered the Three Rivers, Paradise, Flora and North End telephone companies, which operate rural lines with an exchange at Flora, to discontinue their practice of making a "so-called" other line charge of 25 cents in addition to the regular charge for toll calls passing through its switchboard, except to regular subscribers to their exchange service, to whom free interchange is given on outgoing toll messages. In lieu of this charge made upon messages whose origin or destination is within the town of Flora or within a radius of one-quarter mile from the central office, the defendants are permitted to substitute a charge of five cents for each message. Order No. 500.

SOUTH DAKOTA.

May 12: The commission ordered the Dakota Central Telephone Co. to improve its service in Bristol, to lengthen its hours of service and to furnish emergency night service. Upon the completion of such improvements, it is given permission to increase its rates. No. 665.

Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties—Prepared Under the General Supervision of Stanley R. Edwards—This Section, "Part VII, Telephone Engineering Economics," Written by Chas. W. McKay

Quiz Questions on the Preceding Installment.

69. Discuss the reason for insulating a guy strand between electric light and telephone poles. Outline the method of insulation. Describe a well-known type of strain insulator.

70. When a telephone pole is jointly used with wires carrying a street lighting circuit, how should the electric light wire be carried past the telephone wire to the street lamp? Make a sketch showing the arrangement of the wire.

71. Describe a method of holding an aerial cable lead installed upon a straight pole line. Discuss the types of anchors shown in Fig. 15. How may a guy stub be reinforced? What is the usual method of guying to an anchor stub?' Describe some methods of guying difficult corners as illustrated in Fig. 18.

CHAPTER III. Subdivisions of Telephone Engineering C't'd.

72. *Special guying problems.*—It frequently happens that a change in the size of an aerial cable brings about a special

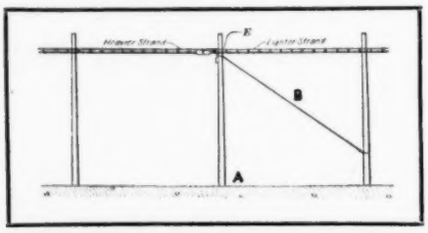


Fig. 19. Method of Guying in Changing Aerial Cable to Lighter Strand.

guy problem. Such a problem is illustrated in Fig. 19. Let us say that a 100-pair cable is terminated at the point *E*, and that from this point on, there is continued a 25-pair cable. Obviously, a lighter messenger strand may be used for the 25-pair than for the 100-pair.

Unless some special provision is made a much heavier strain will be imposed upon the pole *A* than on the one to the right. The equilibrium of the pole *A* may be secured by placing a guy strand as shown at *B*.

Fig. 20 illustrates methods of "dead-ending" heavy cable leads.

Fig. 21 illustrates a method of abruptly terminating a heavy cable lead where it is impossible to place an end anchor or guy strand. It will be noted that the end pole is "cribbed" by means of the logs, *A* and *B*, and that the second pole from the end is guyed to the end pole.

Another peculiar condition requiring the placement of guy strands is illustrated in Fig. 22—that of a pole line erected upon a hillside. Obviously, the strain imposed by the cable will tend to displace the poles

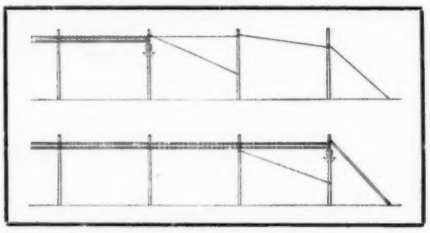


Fig. 20. Methods of Dead-Ending Heavy Cable Leads.

unless this strain is counteracted by the head guys, *A*, *B* and *C*.

73. *Plant engineer's relation to construction foreman.*—In a very general way the difficulties likely to be encountered in pole line construction have been covered. It is most important that the plant engineer shall keep such difficulties in mind in preparing his detailed construction plans. Of course, in many cases it is not necessary for him to prescribe detailed methods of treating such construction problems in view of the fact that the construction foreman is perhaps even better qualified than he, the engineer, to effect an adequate solution.

As previously suggested, however, a competent plant engineer should be thoroughly conversant with construction details and it is thought that over-zealousness on his part will not be taken amiss, and that the inclusion of detailed sketches of difficult or unusual construction problems will be appreciated by the construction foreman and will help toward an adequate solution of the common problem of both constructor and engineer—that

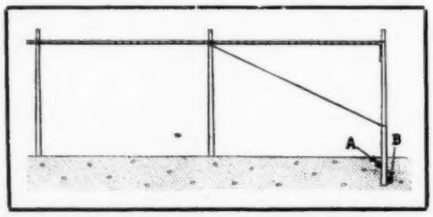


Fig. 21. A Method of Abruptly Terminating a Heavy Cable Lead.

of installing the best possible telephone plant.

74. *The dividing line between open wire and cable.*—In the preparation of plans and estimates for the installation of cross arms and wire, as in the case of pole lines, it is most important that the plant engineer keep in close touch with the fundamental plan.

In preparing detailed construction plans, it should always be remembered that the determination of present requirements is only a part of the problem. Future requirements must be given equally careful attention, and the only proper way to determine future requirements is with the aid of a carefully-prepared development study and fundamental plan.

Possibly the significance of the foregoing statement will be clearer when one considers that immediate requirements may necessitate one or, possibly, two arms of wire. For the same plant, however, the requirements at the end of five-year period, may have so increased that it is reasonable to assume that 20 or more circuits may be required to furnish adequate service.

Obviously, if the plant engineer were to confine his attention only to the im-

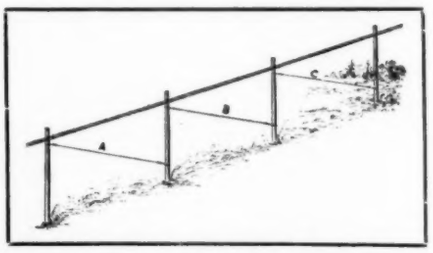


Fig. 22. Guying a Pole Line Erected Upon a Hillside.

mediate future and place one or, say, two arms of wire, he would be confronted with the embarrassing problem of either adding four or five additional arms, or replacing the existing open wire with an aerial cable.

It is impossible to prescribe any definite rule, or set of rules, which will apply to all cases of this kind. Each problem must be solved after careful consideration of its own peculiar features. As a general plan, however, it is not considered good practice to adopt the aerial wire mode of distribution when more than ten circuits—two arms of wire—are required for immediate use.

If more than ten circuits are required at the time the construction plans are prepared, and if the rate of growth as shown by the development study is reasonably rapid, it is generally con-

sidered good practice to place an aerial cable at the time of the original installation. The size of such a cable will be dependent upon the future requirements as shown by the fundamental plan.

75. *Illustration of failure of general rule.*—As previously intimated, the foregoing rule should be regarded rather in the light of a suggestion than as axiomatic. The writer recalls one case where the placing of an aerial cable in lieu of two arms of wire would have been a grievous error in "The Economics of Telephone Engineering."

In this particular case, the immediate requirements called for nine circuits. This, of course, necessitated the placing of two ten-pin arms—one utilized to its maximum capacity, immediately upon the completion of the construction work, and the other with only two spare pin positions (one spare circuit) to provide for future development.

The fundamental plan in this case made it seem exceedingly doubtful if more than one additional arm of wire would be required for at least eight years. Furthermore, the climatic conditions were such as to favor the open-wire type of distribution, the plant being located in a Southern state where there is very little cold weather and where even the "Oldest Inhabitant" cannot remember a sleet storm. In this particular case, also, it so happened that the tree conditions were favorable to open-wire distribution, there being no trees within a space of 15 or 20 feet on either side of the pole line.

Obviously, in a case such as this, the plant engineer would have been at fault if he had adhered strictly to any rule-of-thumb method, calling for the placing of a cable when the immediate requirements necessitated two arms of wire. As a matter of fact, in this particular case, the judgment of the plant engineer in placing an open-wire lead, has been substantiated by subsequent developments. The line is now seven years old and there are less than three arms of wire in use at the present time. Furthermore, the original installation of galvanized iron wire is still existent and in very good condition, due to the favorable climatic conditions.

76. *Location of cross arms on poles.*—It is well for the plant engineer to include in his specifications and work orders for the placing of cross arms, suitable sketches showing the exact location of the arms. The reason for this will be apparent when it is remembered that telephone poles are frequently used jointly with foreign companies. This phase of the question has already been discussed in considerable detail.

Obviously the construction foreman may not know of such proposed joint use and, even if he does know of it, may not be sufficiently familiar with joint-use specifications to properly locate the telephone cross arms. Changes in the location of cross arms to permit joint pole use, or for any other reason, are costly and the necessity for such changes may be largely obviated by proper engineering of the original plans.

There is still another reason why the exact location of the cross arm should be specified by the plant engineer. Frequently the construction of an open-wire telephone line necessitates tree-trimming. If the engineer lays out the line carefully and decides just where the trimming of trees will be necessary, he can obtain, or cause to be obtained, necessary permission from the property owners before the construction work is started and thus obviate costly delays, and what is even more important, friction between the company and the property owners. Many an excellent right-of-way privilege has been lost, due to lack of common sense on the part of the foreman in trimming trees and to lack of diplomacy in dealing with the property owners.

77. *Type and gauge of wire.*—Having completed the preliminary steps in the planning an open-wire distributing line, the next question confronting the plant engineer involves the type and gauge of wire to be used.

Years ago, open-wire distribution was nearly always effected by means of copper wire, and often large gauged copper wire. Obviously, the use of copper wire involves an appreciable capital investment and, while the maintenance charges are usually comparatively low, other things being equal, it is better practice to use a good grade of iron wire. This will apply especially to cases where the development study shows that the open wire will have to be replaced eventually by aerial cable.

In all plants where the rate of growth is reasonably rapid the actual useful life of aerial wire is short, due to the factor of obsolescence. No. 12, or No. 14, B. W. G., galvanized iron wire affords an excellent medium of exchange distribution in cases like the ones discussed.

78. *General rule for selection of type of distribution.*—As previously intimated, a very general rule for guidance in choice between the aerial—wire and cable—methods of distribution is as follows:

When the immediate requirements, as shown by the fundamental plan, prescribe approximately two arms of wire, and where the anticipated rate of growth is comparatively rapid, aerial cables should be installed. Where the immediate requirements are less than two arms of wire and where the rate of growth is comparatively slow, the aerial wire mode of distribution should be adopted.

79. *Temporary distribution method.*—In this connection it is interesting to note that many companies effect a compromise regarding this rule, by the placing of No. 17 B & S copper-clad steel twisted-pair wire as a temporary means of distribution. Some companies attach No. 17 wire to cross arms, while others effect an even more elaborate distribution by placing a suspension strand equipped with rings and pulling enough pairs of No. 17 wire through these rings to care for the requirements for a considerable period of time. (*To be continued.*)

American Telephone Operators Back From France.

Young American women, who as telephone operators did war work in France and are now coming home, are receiving nearly as much attention as the returning Yankee soldiers. Like the doughboys who wore the "tin hats" and carried the rifles, the telephone operators did faithful work and are entitled to the honorable mention they are receiving.

Among the operators returned is Miss Maria Flood, of Chicago, a niece of Finley Peter Dunne, of "Dooley" fame, who presided at the peace conference switchboard in Paris. The New York reporters who interviewed Miss Flood when she landed were surprised to learn that she did not "listen-in" while President Wilson, Clemenceau, Lloyd George and others of the big council used the wires under her control.

For a year, Miss Flood also was operator at the headquarters of the American army at Souilly, which was frequently under fire, and often the object of night raids by the German airmen. She was one of the American girls who stood by their posts while Souilly was afire from bombardment.

Another telephone girl just back from France is Miss Elinor Whittemore, of Boston. She was at Coblenz for a while and had the honor of a dance with the Prince of Wales, who had the temerity to take her away from a Yankee soldier.

Earnings of Keystone Telephone Co. for Month of April.

The Keystone Telephone Co., of Philadelphia, Pa., has issued its comparative statement of earnings for the combined companies for the month ended April 30, 1919, and the two months ended on that date, as follows:

	For Month Ended April 30, 1919	Year Previous
Gross earnings	$130,491	$134,147
Operating expenses and taxes	88,873	75,981
Net earnings	41,618	58,166
Less interest charges	28,521	28,552
Balance available for dividends, surplus and reserve	13,097	29,614
	For 4 Months Ended April 30, 1919	Year Previous
Gross earnings	$519,900	$539,026
Operating expenses and taxes	346,236	305,620
Net earnings	173,664	233,406
Less interest charges.	116,709	114,399
Balance available for dividends, surplus and reserve	56,955	119,007

Sundry Snapshots Along the Trail

Observations and Comments, Pertinent and Otherwise,
On the Sunshine and Shadows of Telephone Work

By Well Clay

Falling asleep 'neath a shady tree
I dreamed it whispered low to me
Of many castles, rich and rare,
Which I had builded in the air.

It told me tales of other lands,
Of orange groves and desert sands,
Of dark-skinned warriors, fierce and wild,
Of hills and rocks and mountains piled.

It whispered tales of oceans wide,
Of fair ships sailing side by side,
And how, within the jungle's glade
The forest children leaped and played.

It told of stately marble halls,
Of brook and stream and waterfalls;
How monstrous fishes swam the sea;
Of beast and bird and busy bee.

I marveled much that it could know,
When it could neither come nor go
Unless the wind had told the tree
These tales that it had told to me.

It now transpires that if man, instead of building high towers of steel to hold networks of wires to catch and transmit sound waves, had grounded his wireless outfit to a tree, he could have saved the expense and obtain quite as satisfactory results. That the tree is a natural radio outfit few people dreamed, but such has been announced to be a fact by men who have, heretofore, been absolutely reliable as to their announcements.

It is no wonder then that there is some truth to the old saying about the whispering leaves and trees having tongues. What is the telephone man going to do if these scientific gentlemen keep on discovering things like this?

Suppose you have a telephone plant which has taken you years to build and much money to keep in operation. Along comes a scientist and tells your rural patron that all he needs to do is to hook a wireless outfit onto the tree in his front yard and he can beat you a mile on the cost of sending long distance messages. Soon he will be receiving not only messages but power to operate his machinery via the tree route.

His mother-in-law can tell him what she thinks of him on a phonograph record and have it attached to a wireless outfit that will translate it into a message, and send it via the tree route. He may think it is only lightning striking the tree at first instead of a message coming in, but he will soon get used to that.

Each rural patron will have a wireless outfit attached to trees and will be able to call up his neighbor without fear of rubbernecks bothering the line. The line to town will never be busy, but the town merchant will have to plant trees all round his store to provide trunk lines for his customers. The young couple out under the tree in the front yard at night will have an alibi as they can explain their presence there by pleading the necessity of calling up some one via the wireless for a conversation relating to business matters.

The grapevine telegraph will now become an actuality instead of a "josh" as it may well turn out that vines, as well as trees, will have qualities along this line that we have never dreamed of. There will have to be no charges for upkeep and repairs for when the tree blows over, all we will have to do is to attach the outfit to another tree and tune up the instruments to the new take-off.

But stay, don't sell your telephone stock for ten cents on the dollar yet and start looking for a job as lineman on the wireless. All these things may be true, and yet it might well turn out that it may never interfere with our business at all.

The horse is still holding his own pretty well in most parts of the world and the mouth organ still holds up in sales in spite of all the new fangled automatic piano players and talking machines. Mother still uses the case knife as a screwdriver in spite of all the automatic screwdrivers offered for sale.

The old reliable telephone service will still be in demand for a considerable period of time, so do not worry. It is more convenient to pay the telephone company a couple of dollars a month to furnish you service and look after the lines than it will be to operate a home-size wireless which may necessitate the services of an expert to keep in repair.

Then, too, the old kind is more tangible and offers something specific on which to hang the line of damaged conversation which you are apt to spill if it does not work. You cannot properly cuss a perfectly innocent elm tree in case your machine fails to record an answer from a friend in response to your signal.

All you can do is to throw the machine down the well, which does not help matters and, after all, what is the use of depriving yourself of the convenient target offered in the person of the lineman or the central operator in case something goes wrong? The American people have been forced to give up too many privileges as it is without surrendering the most treasured of them all. The housewife on the farm would have to forego the delights of "rubbering" on the line and neighborhood gossip would suffer a loss inconceivable.

What you must figure on then, is to continue the business of giving good service, letting the rubbernecks hear what they may, and see that you are getting paid for the kind of service you are giving. That means that you must rebuild your plant at least once in every ten years and adopt the newest available improvements at least two or three times during that period.

You are never through with your tearing down and building up but must continue the work on much the same lines from year to year. New improvements may come and for a time flourish—even a limited few be adopted permanently—but mostly in the end you will find the same proposition you had five or ten years ago. You will have the same line of human nature to deal with that you started with at the outset, no matter how long you stay in the business.

If your wireless works well, you will want to make doubly sure so you will keep the telephone anyhow, figuring that the added cost will be money well spent. The only really serious problem that confronts you today is not any of the things you may think, but only a question of how good is your nerve and do you dare ask the price.

APHORISM: You may buy an automobile but you never discard the wheelbarrow.

Two Indiana Towns Without Telephone Service.

Two Indiana towns—Linton and Jasonville—have been without telephone service since Wednesday afternoon, May 14, and Thursday morning, May 15, respectively, as a result of a disagreement between the New Home Telephone Co. and its operators, and so far as is known no attempts are being made toward a resumption of negotiations.

The employes of the Linton exchange left the switchboard at 4:15 o'clock Wednesday afternoon following the expiration of a temporary two-week agreement that had ended a previous strike, and the girls at the Jasonville exchange, who are affiliated with the union of the Linton operators went out the next morning. The strikers are asking recognition of their union, higher wages and an eight-hour day. Both exchanges are operated by the New Home Telephone Co., which is a part of the Central Union system in Indiana.

Business and commercial interests at both places are becoming restless, it is

said, but neither the company nor the operators are showing any efforts to get together for further negotiations. It is understood that officials of the company have declared they will withdraw their service rather than recognize the union.

The only fire alarm system in the two places is the telephone and with this tied up there is constant danger of destruction of property, according to the business interests. One other system, the Mutual Telephone Co., has a station at Linton but there are few city subscribers, most of these telephones being used by farmers, making it of little use locally and of no service in long distance calls. Coal mines and other manufacturing interests are using the telegraph for long distance communication and messengers for local service.

Unlike the previous strike, which was marked by disturbances of a serious nature by strike sympathizers when Indianapolis young women were sent to Linton to operate the system and which resulted in the calling out of the state militia, the present walkout has been quiet. The company has announced that it will make no further effort to operate its business and residents are attempting to conduct their affairs without the customary aid of the telephone.

Operators at Sullivan and Bloomfield are also contemplating affiliation with the Linton union, it is said, but so far as is known have not yet formed an organization.

Negotiations conducted during the two-weeks' truce resulted in an agreement being reached only on the question of hours, the company agreeing to an eight-hour day and a six-day week. Both sides made some concessions on wages, it is said, but the stumbling block was that regarding the recognition of the union.

Frank Wampler, of Indianapolis, general manager of the Central Union Telephone Co. in Indiana, when discussing the situation, reiterated his declaration that under the policy of the government control laid down by Postmaster General Burleson the operators union could not be recognized. The operators might form a union if they so desire, but they could not force the telephone company to a "closed shop" policy under Postmaster Burleson's orders.

On the policy of the employes forming a union Mr. Wampler stated that the telephone administration had no objections, but they would not recognize the unions. Collective bargaining is permitted under the rulings of the Postmaster General, he said.

It is expected that the investigation board named by Governor Goodrich to report on the Linton situation two weeks ago may be called upon to act as an arbitration board. The committee was composed of Charles A. Greathouse, L. C. Huesmann, of the State Labor Commission, and Charles Fox, president of the State Federation of Labor.

In the meantime all is quiet in the two little mining towns and the residents of both places are gradually adapting themselves to the old-time methods of communication.

Biographical and Personal Notes

Major-General George Owen Squier, Ph. D., of the United States Army, was presented with the Franklin medal at a meeting of the officers and members of the Franklin Institute, held May 21 in Philadelphia, Pa. At the meeting Major-General Squier delivered a most interesting address on "Some Aspects of the Signal Corps in the World War," which was illustrated by still and moving pictures showing Signal Corps activities in France. A limited number of Signal Corps communication devices were also exhibited.

R. B. Gallup, who has been engaged for some time on special work in the engineering and appraisal departments of the Home Telephone & Telegraph Co. of Fort Wayne, Ind., has been appointed to the position of purchasing agent of the company, a position which has assumed new importance since the appropriation of the sum of $50,000 by the company to be devoted largely to the internal improvements of the company's equipment. Mr. Gallup's services in the new relationship,—which will not mean an entire abandonment of his work in the engineering department—became effective May 1. Mr. Gallup has been connected with the Fort Wayne Home company for the past eight years.

John A. Gustafson, manager of the Fredonia Telephone Co., Fredonia, Kans., has a keen and alert mind, is quick on figures and would easily grasp the commercial aspects of a proposition. He is inquisitive and has an aptitude for ascertaining facts readily.

He was born in Marshalltown, Iowa, and after graduating from the Conrad,

John A. Gustafson, Manager of the Fredonia (Kans.) Telephone Co.

Iowa, high school, he attended Cornell College at Mt. Vernon, Iowa. In 1901 he entered the telephone business as manager at Conrad, at the age of 22. From 1905 to 1909 he was district manager for the Corn Belt Telephone Co. at Oelwein, Iowa. He then went with the Kansas City Long Distance Telephone Co. as manager of exchanges in Johnson county.

Three years later he left the employ of the Kansas City company to become telephone inspector for the Missouri Pacific Railway Co. In 1917 he was made manager of the Fredonia Telephone Co., in which capacity he has continued up to the present time.

Mr. Gustafson is an energetic worker. However, he is not given to talking a great deal and would perform a task much quicker than he could explain it.

Casper E. Yost, of Omaha, Neb., after 30 years of service in the telephone business, has retired from active business and resigned from his position as president of the Northwestern group of Bell companies, which includes the Nebraska Telephone Co., the Iowa Telephone Co. and the Northwestern Telephone Exchange Co. Mr. Yost becomes chairman of the boards of directors of the companies of the group. He has long been the dean of the executives of the Bell system. Mr. Yost is 77 years of age.

W. B. T. Belt, vice-president and general manager of the Northwestern group of Bell companies, has been elected president of that group, succeeding Mr. Yost. His headquarters will continue to be at Omaha, Neb. Mr. Belt has been connected with the Nebraska Telephone Co. for about 30 years and has worked his way up from the bottom. He became general manager in 1906 and when the Iowa and Northwestern companies were united with the Nebraska company forming the Northwestern group about 10 years ago, he was made vice-president and general manager.

Guy H. Pratt, general commercial superintendent of the Northwestern group, has been promoted to the vice-presidency. Like Mr. Belt, Mr. Pratt's first connection with the telephone industry was with the Nebraska Telephone Co.

When common battery equipment was installed in the single-office Omaha exchange in 1904, Mr. Pratt was contract agent. Other offices were installed in the succeeding years and Mr. Pratt's jurisdiction and responsibilities increased and he became the company's commercial superintendent, later being made general commercial superintendent of the Northwestern group.

Henry A. Barnhart, formerly representative in Congress, last week assumed the active management of the Rochester Telephone Co., of Rochester, Ind., of which he is president and chief stockholder. The management of the company was placed in his hands by the unanimous vote of the board of directors.

A. A. Lowman, general superintendent of plant of the Northwestern group, has been made general manager to succeed W. B. T. Belt. Mr. Lowman has been with the Bell system 26 years and nine years with the Northwestern group.

From Factory and Salesroom

Conventions: Kansas, Topeka, June 4-6; U. S. Association, Chicago, June 24-26

Development of Skinderviken Button in Motion Picture.

The Skinderviken Telephone Equipment Co., of Chicago, has had prepared a one-reel motion picture study of the development of the Skinderviken transmitter button and coincidentally, that of the company. A very interesting scenario has been built around the company's history.

The film was produced under the personal direction of Frederick J. Ireland, director general of the Emerald Motion Picture Co., Chicago.

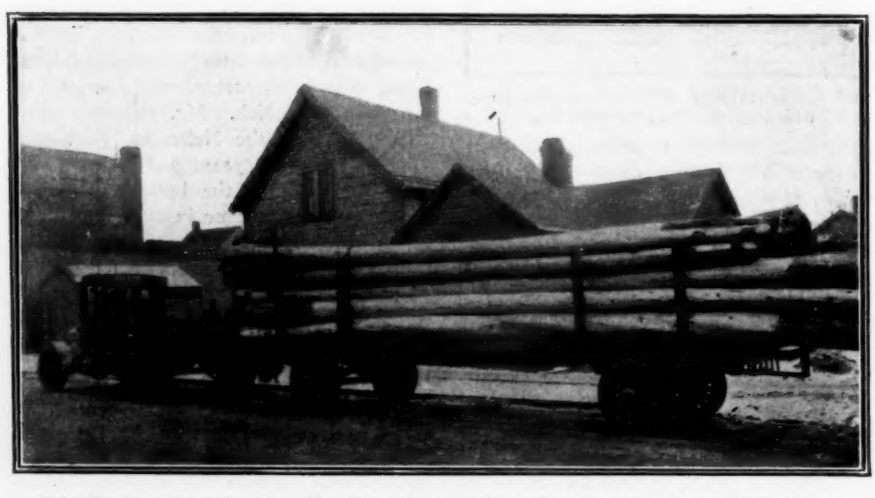
Ohio Automomile Trailers for Hauling Telephone Poles.

The recognition of the truck-trailer unit as the logical solution for many hauling problems—and particularly that of hauling telephone poles—is becoming so widespread that it is hardly necessary to dwell upon the importance of the trailer as a part of the transportation equipment of a telephone company of any size.

The Ohio Trailer Co., of Cleveland, Ohio, for the past two years has been building trailers for the government exclusively but it is now in position to again furnish trailers for commercial use. The trailer shown in the accompanying illustration has been used by the Cleveland Electric Illuminating Co. for hauling poles for something over three years and is reported to be giving excellent service.

The length of the frame is 18 ft., and the length of the wheel base is 18 ft., while the height of the frame from the ground when loaded is 35 ins. The width of the bolster between the stakes is five ft. six inches. The wheels are equipped with 36 by 10 in. sólid pressed-on tires.

Descriptive literature relative to this and other types of Ohio trailers may be obtained upon request.



Ohio Trailer Used by the Cleveland Illuminating Company for Over Three Years.

Stromberg-Carlson Blotter Calendar for Day.

The shortage of labor and the increasing orders for "Quality Apparatus"—perhaps, specifically, the recent order for a 10,000-line exchange to be installed in Shanghai, China—have forced Phoney Bill from the office into the shop. The accompanying illustration from the May blotter calendar of the Stromberg-Carlson Telephone Mfg. Co., of Rochester, N. Y., shows him at work at the forming board. The change evidently agrees with him, for he seems to have taken off some superfluous flesh. "See the new standardized switchboards at the Chicago convention," he says.

Phoney Bill at Work in the Shop.

Vacuum Lightning Arresters and Their Underlying Principles.

The history of lightning protection dates back practically to the history of the practical electrical art or the transmission of electrical currents through conductors.

Benjamin Franklin, when he proved that the identity of lightning and electricity were the same, did it by establishing a means or path for the lightning to pass from the clouds to a kite, and from this kite down a string to a key. The establishment of a conductive medium for lightning from a wire to the earth, is the basis of a practical application of a lightning protector. In other words, a lightning protector is simply a safety valve to establish an outlet for abnormal voltage from an electrical wire or conductor at some predetermined place on the circuit.

Protectors are designed according to the normal operating voltages of the line, with a view that should an abnormal voltage be impressed on this line from any source, whether it be lightning, induction or crosses with a higher potential circuit, that this current would have a ready outlet to the earth. Two things are desired in the proper design of protector:

1. That the normal voltage impressed on the line should be completely dissipated through the arrester into the earth without dividing or permitting the part of the current to pass into the operating instruments.

2. That the protector itself, in so dissipating this current, shall not itself become damaged or have any of its parts affected by the passing of the current.

Various forms of mediums have been employed in arrester protection. The principal ones have been the air-gap, vacuum, non-air-gap (high resistance conductors), electrolytic.

The air-gap principle has been most widely employed in protectors designed for telephone circuits. It features, prin-

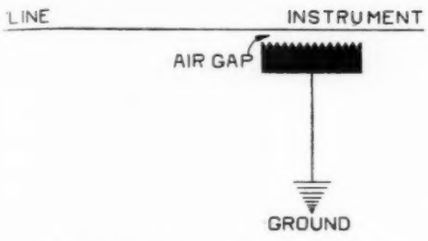


Fig. 1. Principle of Air Gap Arrester.

cipally, conductors mounted on an insulating base having the ground conductor in close proximity to the line conductor with an air-gap intervening, as illustrated in Fig. 1. The closer that the air-gap could be maintained, the more

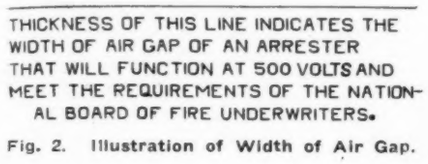

THICKNESS OF THIS LINE INDICATES THE WIDTH OF AIR GAP OF AN ARRESTER THAT WILL FUNCTION AT 500 VOLTS AND MEET THE REQUIREMENTS OF THE NATIONAL BOARD OF FIRE UNDERWRITERS.

Fig. 2. Illustration of Width of Air Gap.

sensitive the arrester. Practice, however, has determined that we are limited in reducing the air-gap space on account of endeavoring to maintain a high normal line insulation after the passing of discharges.

The importance of an arrester functioning below 500 volts is not alone to meet the prescribed requirements of the National Board of Fire Underwriters,

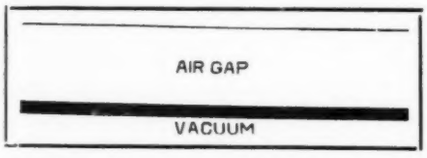


Fig. 3. Space Between Line and Ground in Air and in Vacuum Arresters.

but because these requirements were formulated for the purpose of offering a safeguard to telephone users from crosses with trolley, lighting or power circuits of 500 volts or higher. To appreciate the size of air-gap necessary to effect a proper function in accordance with these requirements, it would be necessary to

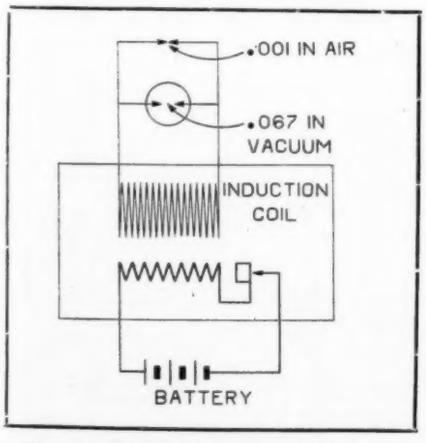


Fig. 4. Comparative Test of Air and Vacuum Arrester.

have the parts separated by an air-gap approximately 4/1000ths of an inch (.004"), or as indicated by Fig. 2.

The vacuum principle of protection is based on the ability of current passing more readily through thin air, or gases at low pressures, then through normal atmosphere.

The L. S. Brach Manufacturing Co. started experimenting a number of years ago, in order to apply this principle to a practical protection of low voltage circuits from lightning, believing that by being able to increase the actual gap between the electrodes and preserve a small air-gap equivalent for high voltage currents and static, Fig. 3, they would not alone be able to function below the 500-volt limit with a spacing far in excess of the air-gap spacing, but be able to main-

Fig. 5.—Type 70 Single Line Cartridge.

tain a higher line resistance. In this, it was very successful and practically non-grounding arresters were developed.

It was found in the vacuum arrester, that many other valuable features were gained, noticeably clearer transmission, a reduction in the number of fuse burnouts, and constant drain for static, together with the advantages of having the discharge take place in a sealed chamber, avoiding any dangers of igniting gases or becoming affected by moisture, corrosion, insects or handling.

The vacuum arrester that was placed upon the market proved to be a great success and came in instant demand and general use among the railway signal, telegraph, fire, police and other important circuits. Its entrance into the telephone field was necessarily slow, owing to the high cost of production, and that the standard designs on the market were

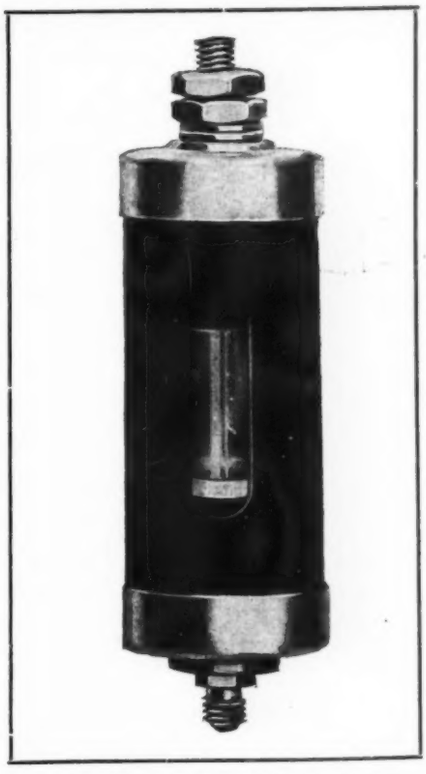


Fig. 6. Type 80 Two-Line to Ground Cartridge.

cumbersome and not readily applicable to universal telephone use.

The Brach company's engineers, recognizing the valuable opportunities which this principle of protection afforded, but realizing that the instrument itself required much needed modification, devoted their energies toward a series of developments and changes in designs, which included enlarging the research laboratory, and the engagement of trained specialists. The results have been gratifying by the production of a new type of vacuum arrester interchangeable with a very large amount of the present telephone equipment. An arrester has been produced sufficiently sensitive to shunt 1/1000th of an inch in air by a vacuum gap of 67 times that spacing, Fig. 4.

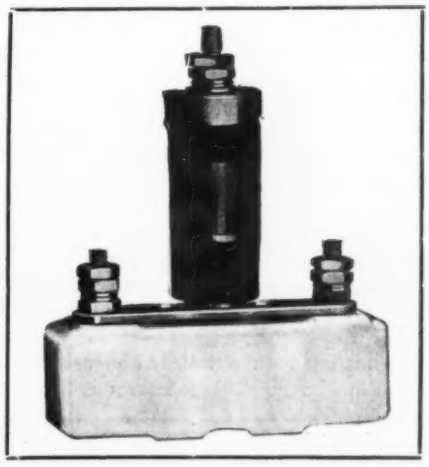


Fig. 7. Type 71 Single Line Cartridge Mounted on Base Without Fuses.

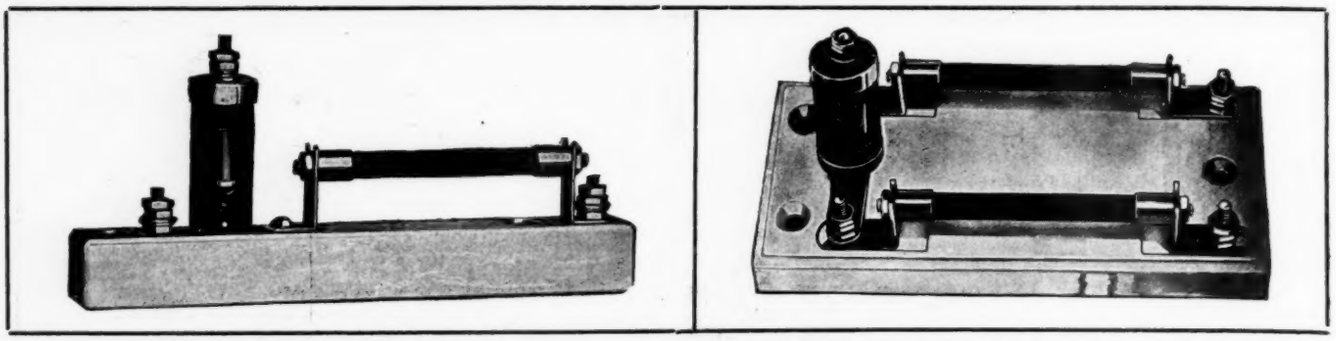


Fig. 8. Type 72 Single Line Cartridge Mounted on Base with Fuses.—Fig. 10. Type 82 Double Line Cartridge with Fuses.

This type of cartridge is protected from discharges by a mica shield internally, and from mechanical injury by a fibre shield externally and, it is declared, will now withstand repeated heavy discharges and reasonably rough handling without dangers of losses.

In Fig. 5 is shown the Brach company's new design of single line cartridge, known as Type 70. It is arranged to be fitted into a number of simple inexpensive mountings which cover practically every requirement that may be desired for telephone subscribers. The ground

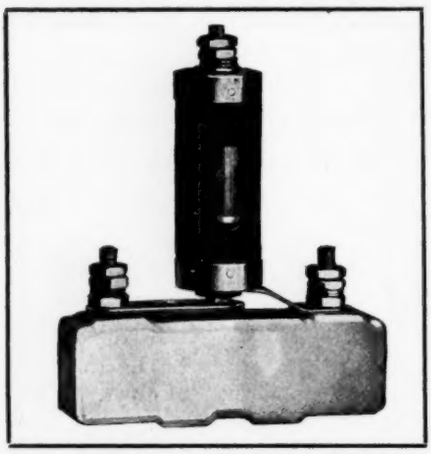


Fig. 9. Type 81 Double Line Cartridge Mounted on Base Without Fuses.

binding post is part of the arrester, being located on the end of one cap.

Fig. 6 shows the two-line to ground cartridge, known as Type 80, which takes care of one pair of circuit wires. This type of cartridge will fit into the several designs of mountings that have been arranged to cover the various requirements for a pair circuit arrester.

Fig. 7 shows the Type 71 single line cartridge mounted on a base without fuses, while in Fig. 8 is shown Type 72 which is mounted on a base with fuses.

A double line cartridge, known as Type 81, is mounted on a base without fuses, is shown in Fig. 9, and a double line cartridge mounted on a base with fuses is shown in Fig. 10. This is known as Type 82.

In Fig. 11 is shown the Type 83 protector, which consists of two fuses and a two-line to ground cartridge, thus furnishing protection against lightning and power currents on telephone lines.

The arrangement of multiple or group mountings in the Type 77 vacuum arrester for use in pole boxes or central stations

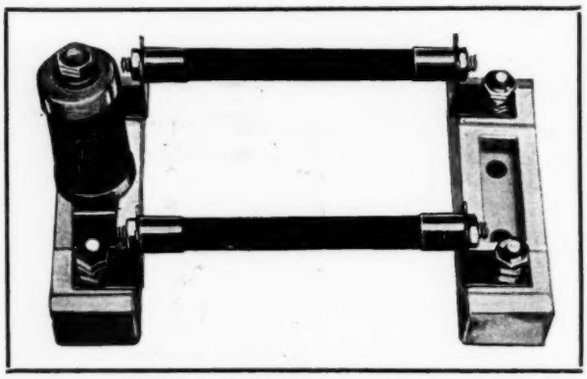


Fig. 11. Type 83 Protector with Two Fuses and Two-Line to Ground Cartridge.

is shown in Fig. 12. The regular Type 70 cartridge is used, with a staggered arrangement for economizing in space. It will be noted that these can be used as single line arresters or in pairs by having two sets of blocks facing. The mountings are furnished in multiples of ten.

Fig. 13 illustrates the arrangement of multiple or group mountings for the Branch Type 87 two-line vacuum arrester for use in pole boxes or central stations. The Type 80 cartridge is used with a staggered arrangement, as in the Type 77 arrester, to economize in space. Standard blocks accommodate ten pairs of circuits with fuses complete. This type can be furnished in can top pole boxes to take care of up to 80 pairs of wires.

The L. S. Brach Mfg. Co., 127-129 Sussex Ave., Newark, N. J., has recently installed a considerable amount of machinery and equipment to meet the heavy demand for these arresters.

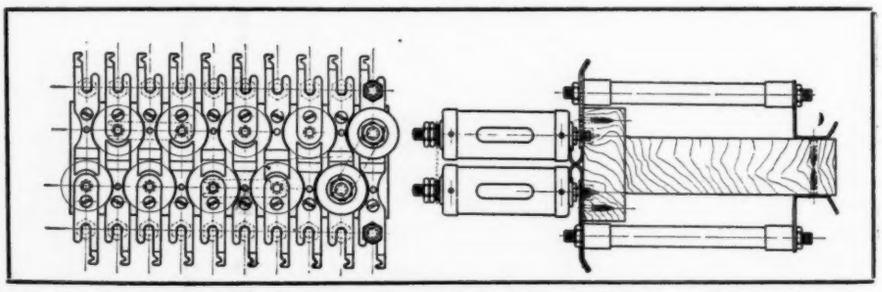


Fig. 12. Arrangement of Multiple or Group Mountings in Type 77 Vacuum Arrester.

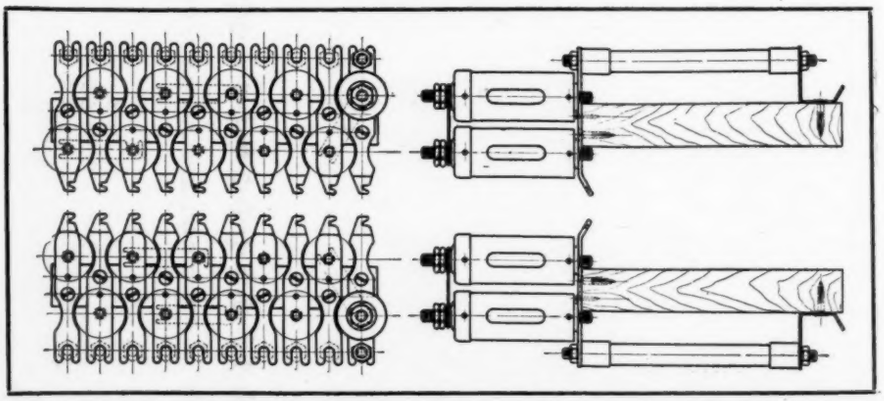


Fig. 13. Multiple or Group Mountings for the Type 87 Two-Line Vacuum Arrester.

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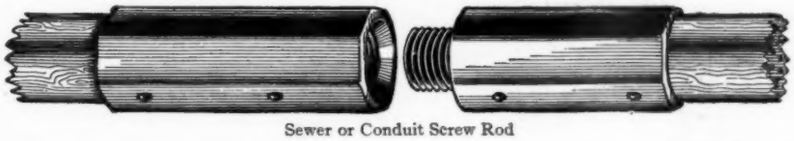

Sewer or Conduit Screw Rod

The castings are octagon shape, made of brass—the thread is the U. S. standard—¾ inch—10 threads to the inch. The rods are of second growth hickory—1 inch in diameter—straight grained—soaked in oil and put through two processes of toughening—they are driven into the castings by machinery and securely held in position by two rivets—carried in stock—3 ft. and 4 ft. lengths.

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Mansbridge Type Condensers are Self-Sealing and cannot be internally short-circuited. If one is broken down by a lightning or high-tension discharge, or by mechanical damage, it automatically and instantaneously seals up, this being the unique and characteristic property of the metallized paper.

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They are made under license by Western Electric Company, Ericsson Mfg. Co., Electric Specialty Co., Stromberg-Carlson Co., American Electric Co., and by numerous other licensees all over the world.

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G.F. MANSBRIDGE

Mount House, New Barnet, England

A New Instrument for Locating Water Trouble in Cables.

Lightning burns sometimes produce water trouble by burning a hole in the armor. Cracks, bullet holes, and other mechanical injuries also cause water to get into cable, and make trouble. This trouble has always been very hard to locate by companies who did not keep a cable expert on hand, and sometimes it even keeps the cable expert guessing.

Stewart Brothers, of Ottawa, Ill., have developed a new cable tester for the location of water trouble as well as the metallic troubles, shorts, crosses, and grounds, which has new features and makes trouble much easier to locate.

It was found after exhaustive tests that in some cases it is easier to locate trouble with a high pitch tone, and in other cases a low pitch tone is the best. The new Stewart cable tester has two vibrators either of which will operate by throwing a switch.

One of the many troubles which was experienced in locating water with an inductive type fault finder, was that the tone went by the trouble and no location could be made. This was sometimes due to the tone on the armor going ahead and sometimes on the capacity of the wire going ahead.

With each Stewart cable tester is sent one of the patented Stewart exploring coils, which eliminates the troublesome feature of the tone going ahead on the armor. By special circuit arrangement, the troublesome feature of the tone going ahead on the capacity of the pair is also eliminated.

The Stewart cable tester, it is stated, has been used for locating trouble a great many places where all other methods failed to locate the trouble, and the trouble was located to an inch. One party reports that he found trouble of such high resistance that he did not think it would ever be possible to locate it with an inductive type fault finder.

New Stewart Cable Tester.

Inasmuch as the location of water trouble in cables has been the source of much worry to many companies, their managers will undoubtedly be interested in the instrument just described.

A number of these cable testers are in use by one of the largest Independent telephone companies, which uses them to locate shorts in as much as six miles of cable at a time. Any cable expert will recognize this as a very severe test for any cable tester of the inductive type.

General Insulate Employes 100 Per Cent in Victory Loan.

The General Insulate Co., Brooklyn, N. Y., the well known manufacturers of "Insulate" and Hi-Heet compositions, reports that its employes—men, women, seniors and juniors—went "over the top" with a 100 per cent subscription to the fifth Victory loan—this after subscriptions ranging from 75 per cent upwards on the several Red Cross and United War Work campaigns and the third and fourth Liberty loans.

Paragraph.

W. N. MATTHEWS & BROTHER, INC., of St. Louis, Mo., have discontinued their Washington office and moved their New York office from the Hudson Terminal building, 30 Church street to the Hudson Terminal building, 50 Church street, Room 468. Warren M. Heim is Eastern district manager, in charge of the New York office.

OPPORTUNITIES (Continued From Page 43)

HELP WANTED

TELEPHONE ENGINEERING OPENINGS. We have positions offering excellent opportunities to enter the telephone engineering field. Training in electrical engineering or practical telephone experience is necessary. In reply state age and particulars of experience. Address 3647, care of TELEPHONY.

WANTED—Plant supt. and wire chief for common battery exchange of 1,200 stations in central Kansas. Must be good switchboard and all around telephone man. Give experience, references and salary expected in first letter. Address 3663, care of TELEPHONY.

WANTED—Switchboard maintenance men with long experience in maintenance or erection of toll switchboards. Give full details and salary received and expected. Address 3649, care of TELEPHONY.

WANTED—Wire chief for exchange of six hundred phones. Must be common battery man and willing to work. Permanent position. Ainsworth Telephone Co., Ainsworth, Neb.

POSITIONS WANTED

WANTED—Position, by A1 telephone man; 15 years' experience. Magneto and common battery exchanges. Foremanship switchboard departments Western Electric, Kellogg and Chicago Telephone Supply Co. Will consider manufacturing rebuilt or exchange propositions. Address M. H. Brown, Three Rivers, Mich.

POSITION WANTED—As manager, wire chief, or trouble shooter. Now employed in central Iowa. Desire change. Prefer northern Oklahoma or southern Missouri, account of relatives. Best references. Address 3646, care of TELEPHONY.

WILL BE open for employment June first; eight years' experience; magneto plant experience. Western Missouri or eastern Kansas preferred. References. Good reasons for changing. Address Sam Kelly, Linneus, Mo.

WANTED—Position as manager, plant chief, or wire chief, by young man of thorough experience. Good reason for making change. Address 3650, care of TELEPHONY.

MISCELLANEOUS

EVEN IF THERE IS SOME PART OF YOUR APPARATUS which is almost worn to a "frazzle," don't ditch it—send it to our repair experts. They'll make it like new. We give the same attention to a small as well as a large order. The Suttle Equipment Co., Olney, Ill.

EQUIPMENT WANTED—2500 second hand solid back transmitters, with mouthpieces and backs. Smaller quantities considered, but price them right. Address Lock Box 134, Olney, Ill.

FOR SALE—At a bargain—a 300-line Sumpter switchboard. Write for particulars. Address Florida Telo. Co., Live Oak, Fla.

STATE OF WISCONSIN IN CIRCUIT COURT FOR BAYFIELD COUNTY
St. Paul Electric Company, Plaintiff,
vs.
Bayfield County Telephone Company, Defendant.

By an order of the Circuit Court of the County of Bayfield, State of Wisconsin, made and entered on April 28, 1919, in the above entitled action.

IT IS ORDERED, that all persons, firms or corporations having claims or demands against the defendant, Bayfield County Telephone Company, other than those secured by a mortgage or collateral, duly filed or recorded, are required on or before the 31st day of May, 1919, under penalty of hereafter having said claims disallowed in the discretion of the court, to file the same with Walter S. Cate, receiver herein, at his office in the City of Ashland, Ashland County, Wisconsin, which said claims or demands shall be supported by affidavits, and shall set up the amount and nature of any security or lien held by the claimant and to which the claimant is entitled; and also any claim to preference to payment from the assets in the hands of the receiver or the earnings therefrom in priority to the general creditors.

Dated April 28, 1919.

Walter S. Cate, Receiver,
Masonic Temple,
Ashland, Wisconsin.

A. W. MacLeod,
Attorney for Receiver,
Washburn, Bayfield County, Wisconsin.

TELEPHONE EXCHANGES bought and Sold. Write for bargains or list your properties for quick sale. Farm lands to exchange. G. W. Leyda, Deerfield, Wis.

WANTED—Kellogg 101-E combined drops and jacks from 100 to 300, five per strip. Address 3657, care of TELEPHONY.

WANTED—Baird Lockout Telephones. Walworth Telephone Co., Walworth, Wisconsin.